NSG 3060
EMC TEST SYSTEM
USER MANUAL

601-273E

TESEQ
Advanced Test Solutions for EMC

NSG 3060
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WARNING - Lethal danger from high voltages and the risk of radiating illegal electromagnetic interference.

This system must be used only for EMC test purposes as specified in these operating instructions.

The NSG 3060 must be installed and used only by authorized and trained EMC specialists.

Personnel fitted with a heart pacemaker may not operate the instrument and must not be in the vicinity of the test setup while it is in operation.

When the system is used in conjunction with options, accessories or other equipment the safety instructions concerning those devices must also be observed.

1 EXPLANATION OF SYMBOLS

Please take note of the following explanations of the symbols used in order to achieve the optimum benefit from this manual and to ensure safety during operation of the equipment.

The following symbol draws your attention to a circumstance where non-observation of the warning could lead to inconvenience or impairment in the performance.

Example:

This connection must not be confused with the Equipment under Test (EUT) power input.

The following symbol draws your attention to a circumstance where non-observation of the warning could lead to component damage or danger to the operating personnel.

Example:

Never connect or disconnect the EUT while the test system is performing a test.

2 INTRODUCTION

2.1 General description

The NSG 3060 test system enables cable-borne EMC (electromagnetic compatibility) immunity tests to be carried out on electrical equipment intended for household, office, light industrial or commercial use. The test system is a concept from Teseq AG for electromagnetic immunity testing purposes and fulfills the requirements to accomplish CE marking.

It is an open system, built on a modular principle that communicates through a serial and standardized bus system and has open interfaces available. Operation is performed by means of standardized operator interfaces.

As a result of its modularity and the use of industry standards for the interfaces, operating elements and expansion functions, the most widely varied instrument configurations can be readily constructed from the basic building blocks. Single function generators, customer-specific combinations, multifunction generators for comprehensive test routines to product standards, generic standards and basic standards, as well as combinations with special coupling devices are all easily configurable.

A master controller in the NSG 3060 system architecture takes care of all the "real-time" control functions and communicates with all the function modules both within the instrument's casing and external devices via an interbus link.

The system has a simple construction. All function units contain a slave controller. All these units are connected together through their slave controllers and networked with the central master controller via a field bus (Interbus). Information concerning the special features and their adjustable parameters are stored directly in the function modules. In addition to this bus system, the NSG 3060 system also has a further interface standard, Ethernet, with which the system

can be controlled via single PC, a computer network or even via the Internet.

This modularity enables the function units to be re-combined in ever newer instruments and subsystems. The function units can be readily expanded to cope with new standards and new function units for new parameters can be incorporated in existing systems.

To ensure optimal user and equipment safety, only industry-standard and correctly specified plugs and sockets are used throughout. High voltage outputs are switch-protected.

3 STANDARDS AND APPLICATIONS

The NSG 3060 test system is designed primarily for cable-borne transient interference tests as specified in the European generic standards IEC/EN 61000-6-1 covering equipment for household, office and light industrial use, and IEC/EN 61000-6-2 for applications in industrial environments. The NSG 3040 generates these tests in accordance with IEC/EN 61000-4-2, -4, -5, -11, -12 and -29. Accessories are available for generating optional tests to IEC/EN 61000-4-8 and -9, and to ANSI/IEEE C.62.41.

The EU directive No. 89/336/EEC (for the assignment of the CE symbol) refers to these standards and to this type of equipment.

3.1 ESD test

ESD tests (in accordance with IEC/EN 61000-4-2) must be performed with a separate ESD simulator, such as the Teseq NSG 435, NSG 437 or NSG 438. The standard calls for both air and contact discharges, and the simulator is supplied with special tips for each type of test. In the case of air discharges the simulator is discharged by holding the tip close to the Equipment Under Test (EUT). Then, while depressing the trigger, moving it closer to the target area until a discharge occurs. Contact discharges occur with the tip of the simulator in direct contact with EUT.

3.2 Burst test

Burst tests in compliance with IEC/EN 61000-4-4 simulate the high voltage/high frequency interference pulses typically produced when an inductively loaded switch is operated. Without countermeasures, such interference may occur when a current through an electromagnetic device, e.g. motor, circuit breaker, relay, fluorescent lamp, etc. is switched off.

This type of interference can affect other equipment in either of following two ways. Firstly, the interference can be coupled directly into the target equipment

via the mains power cable. The interference can be transmitted from the source along the mains power cable connected to the target. Interference from the mains can reach any other piece of equipment connected to the same power source in a similar way, however this does not all have to occur in the same section of a building.

Alternatively, the interference can be capacitively coupled into any target device in the vicinity.

The system enables a test to be performed using both standardized coupling methods. The EUT is connected to the mains power socket on the front panel of the test system for the direct mains injection test. Capacitively coupled tests require the interference to be superimposed onto the signal or data line cables via an external coupling clamp that is connected to the burst output on the front panel of the system.

3.3 Combination wave and ring wave test

The surge test, in compliance with IEC/EN 61000-4-5, ANSI C.62.41 and IEC/EN 61000-4-12 Ed.2.0:2006. Duplicates high voltage/high energy interference as experienced with a lightning strike. Generally speaking the interference finds its way into household equipment via the mains power supply.

This kind of interference can affect equipment in either of two ways. Firstly, the interference can be coupled directly into the equipment via the mains supply. The interference is conveyed directly from the source (e.g. lightning strike to external power cables). Every item of equipment connected to this power source will be affected by the interference pulses.

Alternatively, the pulses from the source of the interference or its associated mains cables can be coupled into other equipment positioned nearby.

Surge pulse interference can also occur on signal and data lines through coupling effects and electrical discharges.

The system enables tests to be carried out using both coupling methods. The EUT is connected to the mains power socket on the front panel of the test system for direct mains injection tests. Externally coupled tests require the

interference to be superimposed onto signal/data line cables via an external coupling unit that is connected to the surge output on the front panel of the system.

3.4 Telecommunication wave test

The 10/700 µs telecom wave generator module is used to test ports intended for connection to symmetrical communication lines.

The **T**elecom **S**urge **M**odule TSM 3751 generates test pulse of 10/700 µs as described in IEC/EN 61000-4-5:2005 and IEC 60060-1, ITU-K series, ANSI/IEEE C62.41 and several EN standards and the safety standard of UL 1950. Since tolerance can be taken into account, it will cover the 9/720 µs pulse given in ANSI-TIA-968_B.

Therefore the pulse will fulfil the new IEC recommendation of open circuit voltage of 10/700 µs and the short circuit current pulse measuring of 5/320 µs.

The test voltage satisfies the basic requirement of IEC up to 4 kV and surpasses the UL1950 safety test recommendation of 7 KV.

3.5 Mains quality test

The mains quality test includes the simulation of dips and interruptsouts of the mains power supply in accordance with IEC/EN 61000-4-11 and for DC power supplies in accordance with IEC/EN 61000-4-29.

A voltage dip occurs when the supply voltage falls considerably below the nominal level for a relatively short time, e.g. for a few cycles, whereas an interrupt means that the voltage falls to zero for a similar period.

3.6 Magnetic fields with mains frequency (option)

Mains frequency magnetic field tests, or, POWERM tests, involve the simulation of the magnetic fields typically generated by the current flow in power supply cables as specified in IEC/EN 61000-4-8. Such magnetic fields can affect the operation of items of equipment that are sensitive to them. The NSG 3060 performs this test by causing a heavy current to flow in a magnetic field coil such that the current and frequency produce a proportional field within the coil parameters.

The magnetic field coils, available as accessories, are connected to the magnetic field option (MFO) which, in turn, is connected to the system.

3.7 Pulsed magnetic fields (option)

Tests with pulsed magnetic fields, or PULSEM tests, simulate the type of interference produced by surge pulses as a result of lightning strikes to buildings and other metallic structures such as freestanding masts, ground conductors, grounding networks, etc. as specified in IEC/EN 61000-4-9. Magnetic fields of this type can upset the operation of installations that find themselves within such fields. The NSG 3060 erforms this test by causing a heavy current to flow in a magnetic field coil such that the amplitude of the pulse current produce a proportional field within the coil parameters.

The magnetic field coils, available as accessories, are connected to the surge pulse output socket via an INA 753 pulse shaping network.

4 SAFETY INSTRUCTIONS

The NSG 3060 system and its accessories operate at high voltages.

Improper or careless operation can be fatal!

These operating instructions form an essential part of the equipment and must be available to the operator at all times. The user must obey all safety instructions and warnings.

Neither Teseq AG, Luterbach, Switzerland, nor any of its subsidiary sales organizations can accept any liability for personal, material or consequential injury, loss or damage that may result from improper use of equipment and accessories.

4.1 General

The NSG 3060 must be operated only by authorized and trained specialists.

The generator is to be used only for the purpose specified by the manufacturer. The user is directly responsible for ensuring that the test setup does not cause excessive radiated interference which could affect other instrumentation. The test system itself does not produce any excessive EM radiation. However, the injection of interference pulses into a EUT can result in it and/or its associated cables radiating electromagnetic radiation. To avoid unwanted radiation, the standards organizations recommend that the test setup be operated inside a Faraday cage.

WARNING - Because of its construction, the NSG 3060 is not suitable for use in an explosive atmosphere.

WARNING - Personnel fitted with a heart pacemaker must neither operate the instrument nor approach the test setup while a test is being executed.

Only approved accessories, connectors, adapters, etc. are to be used to ensure safe operation.

WARNING - Connect the EUT only after the initial system self test has finished.

4.2 Installation

The NSG 3060 test system conforms to protection class 1. Local installation regulations must be respected to ensure the safe flow of leakage currents.

WARNING - Operation without a ground connection is forbidden!

Two independent ground connections are necessary - one for the test system and one for the EUT. These must be connected back to the local permanent installation or to a fixed, permanent ground conductor.

Operate the equipment only in dry surroundings. Any condensation that occurs must be allowed to evaporate before putting the equipment into operation. Do not exceed the permissible ambient temperature or humidity levels. Use only officially approved connectors and accessory items.

Ensure that a reliable return path for the interference current is provided between the EUT and the generator. The ground reference plane and the ground connections to the instruments, as described in the relevant test standards, serve this purpose well.

The test system may only be opened by a qualified specialist upon specific instruction given by the manufacturer. Since the instrument works, on principle, with two independent power supplies (one for the generator and one for the EUT), the NSG 3060 must be disconnected from both sources before any modifications to the test setup are undertaken. Besides the mains connections themselves, certain components also operate at high voltages, and are not provided with any form of extra protection against accidental contact.

4.3 Installation of an EUT power switch

The EUT input should be connected through a properly rated power switch device, which should be located close to the test setup. In order to ensure easy and quick access to the EUT power, the switch should be clearly and visibly labeled as "EUT power ON/OFF".

The in-house power distribution must be equipped with a proper circuit breaker and an emergency off button as per IEC 61010-1:2001.

The test setup should only be accessible to trained personnel.

Dimensioning of the mains supply and rating of fuse protection of the AC or DC power supply must conform with local electrical codes and EUT requirements. Inappropriate arrangement, mounting, cabling or handling of the EUT or ground can hamper or negate the effectiveness of the NSG 3040's safety features.

4.4 Applicable safety standards

The NSG 3060 conforms to the safety requirements specified in IEC 348 and offers all the features necessary for safe and efficient operation.

Development and manufacture is in compliance with ISO 9001.

The system complies with the safety requirements of IEC/EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use).

Like all mains-powered generators, the system is designed for high voltage working safety in accordance with VDE 0104.

Interference immunity has been tested in accordance with EN 61326-1.

It is the user's responsibility to ensure that the test rig does not emit excessive electromagnetic interference (EMI) that might affect other equipment. The test system itself does not produce any excessive radiation; however, the injection of interference pulses into the EUT can result in the device and/or its associated cables radiating EMI. To avoid radiating unwanted interference the standards organzations recommend that the test setup be located in a Faraday cage.

Since the purpose of the test system is to produce interference signals for interference immunity testing, the requirements in the IEC/EN 61000 series concerning limiting the radiated EMI can only be complied with by operating the test system inside a Faraday cage.

4.5 Test execution

WARNING - The test area must be organized so that unauthorized persons do not have access during the execution of a test. If a safety contact (Interlock) is used as a means of access control to the test zone (e.g. a Faraday cage), then an additional contact connected in series is necessary to provide protection for parts of the EUT that are likely to be touched accidentally.

During a test, the EUT together with its accessories and cables are to be considered live at all times. The test system must be stopped and the EUT supply disconnected before any work can be carried out on the EUT. This can be achieved simply by opening the interlock circuit.

The EUT is to be tested only in a protective cage or under a hood which provides protection against electric

shock and all manner of other dangers pertaining to the particular EUT (see: User warnings - Generator).

The user must observe safety instruction for all the instruments and associated equipment involved in the test setup.

Test setup configuration is to be strictly in compliance with the methods described in the relevant standard to ensure that the test is executed in a compliant manner.

4.6 User warnings - Generator

WARNING - Users must be aware of the following dangers that can occur during testing:

- Local burning, arcing, ignition of explosive gases.
- EUT supply current surge caused by a flashover or breakdown resulting from the superimposed high voltage.
- Disturbance of other, unrelated electronics, telecommunications, navigational systems and heart pacemakers through unnoticed radiation of high frequency energy.
- In the test system the interference voltage, corresponding to the level called for in the relevant test specification, is superimposed also on the EUT's protective earth conductor. Earth contacts or pins (e.g. as in German and French mains plugs) as well as the EUT earth itself can therefore be at an elevated voltage level that would make touching dangerous. In many power connectors even the screws are linked to the protective earth.

4.7 Dangers concerning the EUT

WARNING - Users must be aware of the following dangers that can occur during testing:

- **EUTs are often functional samples that have not yet been subjected to safety tests. It is therefore possible that the EUT could be damaged by internal overloads or may even start to burn.**
- **As soon as the EUT shows signs of being disrupted the test should be stopped and the power to the EUT switched off.**
- **Internal disruption of the electronics can result in the interference voltage or the EUT supply voltage being present on the EUT's outer casing.**
- **Electrical breakdown or arcing from connections that are overstressed voltagewise during the test.**
- **Explosion of components with fire or fragmentation as a result of energy dissipated, e.g. from the resultant supply current or ignition of vaporized plastic materials.**
- **Faulty behaviour by the EUT, e.g. a robot arm strikes out or a temperature controller fails, etc.**

5 FIRST STEPS

This chapter contains a short checklist with steps that should be taken before the instrument is switched on and put into operation.

Check the packaging for signs of damage in transit. Any damage should be reported immediately to the transportation company.

Lift the NSG 3060 test system out of its packaging by grasping of the mounted grips.

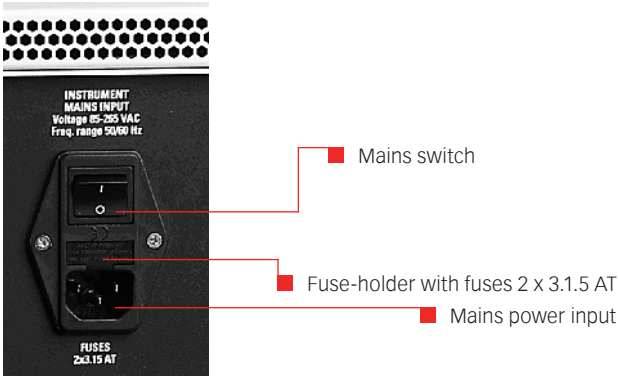
Using the following list, check that all the items ordered have been delivered:

1. NSG 3060 generator
2. CDN 306x coupling network
3. User manuals
4. 2 HV surge cables Fischer/Fischer connector
5. 1 HV burst cable SHV/SHV connector
6. 1 system cable (connects the CDN to the NSG)
7. 2 mains power cables for the test system
8. 1 termination plug (interlock blind connector)
9. 1 ground cable (to reference ground plane)
10. 1 EUT power input connector with cable
11. 1 EUT power output connector
12. WIN 3000 Remote control software (trial version)
13. Ethernet cable, typ: SFTP, CAT 5e, 2 m
14. Ordered options

Check the instrument for signs of transport damage. Any damage should be reported to the transportation company immediately.

5.1 Installation of the NSG 3060 system

The mains power voltage indicated on the instrument must correnspond with the local supply voltage (mains voltage: 85–265 VAC, universal power unit, mains frequency: 50–60 Hz).



Mains switch, fuse holder and power input

To replace a fuse:

1) Disconnect the mains cable
2) Pull the fuse holder out of the connector
3) Remove the damaged fuse(s)
4) Insert 1 or 2 x 3.15 AT fuses
5) Replace the fuse holder
6) Plug the mains cable into a power outlet with a solid ground connection
7) Note the polarity of all input and output connections
8) Place the test system so that there is sufficient free space around the cooling air inlets on both sides and behind the fan outlet on the rear panel
9) Switch the system on and operate as instructed in this manual

5.2 Connecting the system to the ground reference plane

As mentioned in the standard, the generator must be placed on a ground reference plane which is connected to ground. A good high frequency ground connection between the test system and the ground reference plane (GRP) is absolutely essential for performing burst tests correctly.

Connect the ground terminal on the front panel of the NSG 3060 to the ground reference, plane using the link and bolts supplied. If a CDN is connected please refer to section “Reference ground connector”.

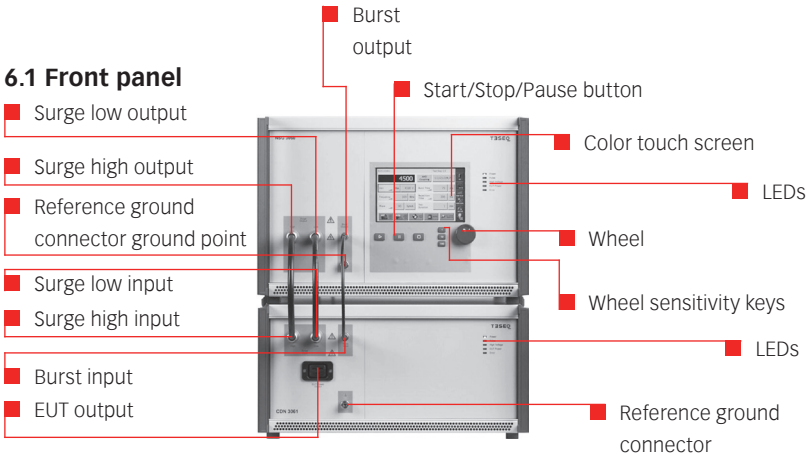
5.3 Mounting in a 19” rack

When the NSG 3060 test system is combined with other equipment, it can be useful to mount the instrument in a 19” rack. The unit is 19” wide and 7U in height (an additional 5U is required for the CDN 3061). An optional rack mount kit is available.

6 MAINFRAME DESCRIPTION

The 3060 housing NSG is specially designed for EMC applications and is EMC approved.

6.1 Front panel



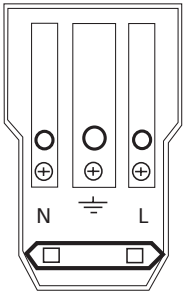
NSG 3060 front panel

6.1.1 EUT output connection

This is the power output connection for the EUT.

An EUT mains power connector is included with the system. The connector contains a phase pin (L: Live), Neutral pin (N) and a ground pin for connection of the EUT. The pins in the connector must be correctly wired to the corresponding conductors in the EUT power cable.

If the test system is connected to a DC power source as supply for the EUT, the user must ensure that the polarity at this connector corresponds with that at the EUT power connector.



EUT output connection

Note: For DC power supply L = positive (+), N = negative (-).

The pins in the connector are designed for a maximum current of 16 A.

WARNING - Never attempt to connect or disconnect an EUT while a test is being performed.

6.1.2 Reference ground connector

This terminal provides a solid reference ground connection point to the test system. If a CDN is connected then the ground strap must be connected from the CDN to the ground reference plane. There is no need to connect the ground connector from the generator itself, since the burst connector provides the reference ground from the generator to the CDN.

Reference ground connector

The NSG 3060 can be efficiently connected to the GRP using the ground strap supplied with the system.

This ground link must be used for burst tests to obtain reproducible test results.

6.1.3 Surge output sockets

These sockets (high, low) connects the surge output signal to a 1-phase or 3-phase coupling unit, or to a CDN (CDN 117/118) for data lines.

These coaxial sockets are also used to connect the generator to the optional magnetic field coil for tests with pulsed magnetic fields.

The surge output is potential free (floating). The inner conductor of each connector is the surge high and surge low connection respectively, while the outer conductor (screen) is connected to the NSG 3060's ground point.

6.1.4 Burst output socket

This socket connects the instrument to a 1-phase or 3-phase CDN or to a burst coupling clamp for capacitive coupled burst tests on data lines.

6.1.5 Indicator LEDs

The five indicator LEDs serve to show the most important test system conditions:

LED indicator	Function
Power on	Instrument / system in operation
Pulse	Shows the occurrence of a pulses or a test event
High voltage active	Shows that high voltage is present in the instrument
EUT-Power on	Indicates when the EUT power supply is present at the EUT connector on the front panel
Error	Indicates that a system error has occurred

The LEDs switch on and off during the boot period and when errors occur.

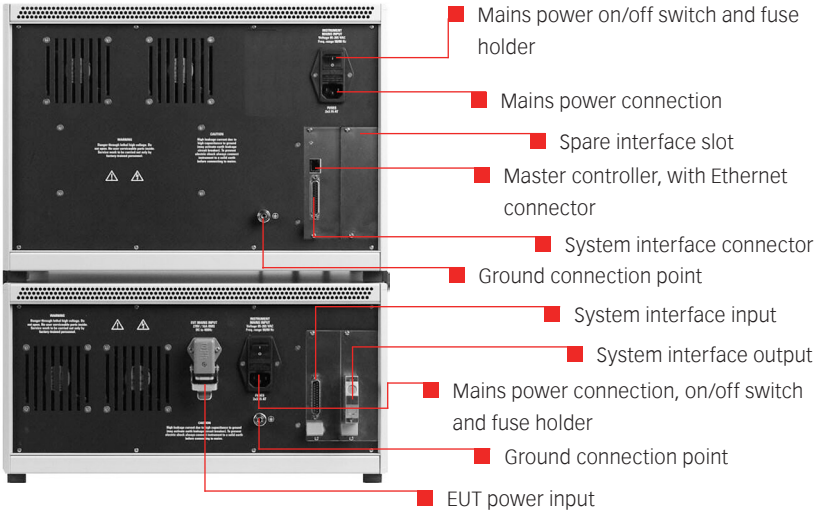
6.1.6 Touch screen and user interface

The color 7" touch screen display controls include a wheel and 3 sensitivity keys used to 1, 10 or 100 steps per wheel click. The Start, Stop, and Pause keys are used to control the procedure.

All user interface function menus and sub-menus are described in chapter 7, standard user interface.

6.2 Rear panel

System configured with NSG 3060 (top) with CDN 3061 (bottom).


Mains power on/off switch and fuse holder
Mains power connection
Spare interface slot
Master controller, with Ethernet connector
System interface connector
Ground connection point
System interface input
System interface output
Mains power connection, on/off switch and fuse holder
Ground connection point
EUT power input

NSG 3060 rear panel

6.2.1 Mains power input

The mains input is the connection point for power to the NSG 3060.

NOTE - Do not confuse the Mains power input with the EUT power input.

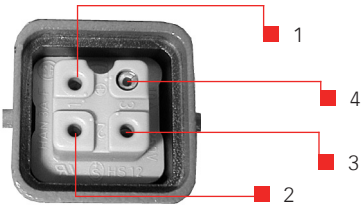
This input contains the mains power input connector and the mains fuses.

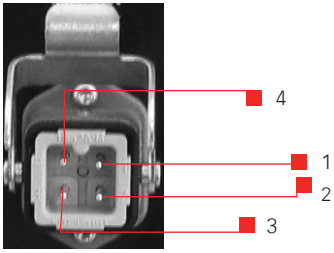
WARNING - Before operating the NSG 3060, make sure that the voltage shown on the mains input module corresponds with the voltage of the local supply to which the instrument will be connected, and that the fuses are correctly rated (2 x 3.15 AT).

6.2.2 AC EUT mains input

The EUT mains input is the connection point for the power source which supplies power to the EUT. The 4-pin connector is a special 16 A type. A mating plug with 2 m of cable for supplying the EUT from a normal mains outlet is included with the system.

The connector is comprised of the pole contact (La, No.1), the variable voltage pole contact (Lb, No.3), the neutral return contact (N, No.2) and the ground connection to the EUT. The zero cross reference for synchronization purpose is taken all the time from L to N.



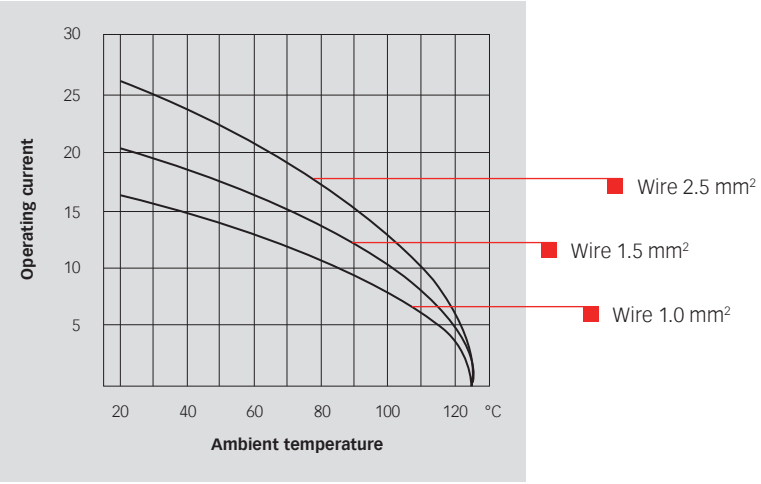


AC EUT mains input

- 1 L = Phase black
- 2 N = Neutral blue
- 3 = Variable voltage pole red/or brown
- 4 = GND - Earth green/yellow

Wire colors and functions

Black:	Phase conductor	La Pin 1
Blue:	Neutral return	Pin 2
Red or brown:	Variable voltage pole	Lb Pin 3
Green / yellow:	Ground conductor	Pin 4



The additional variable voltage pole contact (Lb, No.3) enables a variac or alternative AC source, or a DC source to be connected for PQT tests. In this way the voltage at the phase (L) line at the EUT output connector can be varied in relation with the voltage at this contact.

WARNING - Pulse overshoot spikes of up to 900 V can occur on these power lines. Such voltages can, under certain circumstances, destroy power supplies. It is the user's responsibility to provide adequate protection at the source input.

6.2.3 DC EUT input

For DC voltages: L = positive (+), N = negative (-)

In DC applications, the positive and negative lines are to be connected to La and N respectively. The polarity at this EUT power input connector must be the same as at the EUT output connector.

The connector's ground contact must be connected to a good, solid ground point.

Capacitors in the coupler can cause ground leakage currents of up to 4 A the EUT power supply network. The test system must therefore be properly grounded and powered from a supply that is not protected by a residual current detector (RCD).

The power source to this connector provides the power for the EUT. Burst and surge interference signals are coupled into this supply line internally. Power is also delivered via this route for PQT (mains quality) testing purposes.

6.2.4 Ground connection point

Like the reference ground connector on the front panel, this ground terminal provides a solid connection point to the NSG 3060's chassis ground.

6.2.5 System interface connector 25 pin D sub

Pin #	Sync.line	Signal	Remark	Working direction
7	Sync0	Mains synchronization	Mains voltage passes through the zero crossing point with rising signal level	From a coupling network
5	Sync1	Interlock	Puts the NSG 3060 into an idle state. The «Error» LED lights in this state	From each controller/ to interlock circuit
6	Sync2	EUT fail	EUT reports a fault to the NSG 3060 software. The test is stopped	From EUT to master controller
18	Sync3	Trigger to oscilloscope	External device receives the Trigger-to-Scope signal from the generator	To/from the active function module, the slave controller and master controller
17	Sync4	Pulse enable	External device stops the test run	From external device to the slave and master controllers

Pin #	Sync.line	Signal	Remark	Working direction
4	Sync5		Freely definable sync bus signal	Freely definable, for later options
16	Sync6		Freely definable sync bus signal	Freely definable, for later options
3	Sync7	Reserved	Internal usage (debug mode)	
2, 8, 15, 20		GND	Sync bus ground return	
1, 9 14, 21		+ 24 V	Interbus +24 V supply	
19		Interlock return	Interlock return line	
All others		Interbus lines		

See chapter “System interface connector functions”, for more detail.

6.2.6 Synchro-Bus system

This connection includes external device control and interlock capability. If the NSG is used only as a stand alone unit, the termination connector needs to be plugged otherwise the unit will not start.

All connected accessories will be detected automatically. Written tests are linked with this accessories so if other accessory is connected, it may get an error if the test contains not the suitable accessories.

Any automated CDN and complementary automated equipment like variac, step transformer etc. need to be linked together. Thereby the termination connector needs to be moved to the system output plug of the last unit of the system.

Since time-critical information might not be transferred quick enough (transmission time for one message frame takes about 20 ms), an additional bus called the synchro-bus is used instead where speed matters. The master controller,

together with the function units in the same instrument, can access this bus. The controller also makes this bus available to other instruments via a connector on the rear panel.

The interfaces for the interbus, interlock and synchro-bus are bundled together in a sub-miniature D-connector. These three interfaces are looped through from one instrument to another.

Signal	Remark	Working direction
Mains synchronization	Mains voltage passes through the zero crossing point with rising signal level	From coupling network
Interlock	Connects / interrupts HV supply and EUT power relay (2 wires)	From each controller to interlock circuit
EUT fail	The NSG 3060 software can stop a test run if a fault caused by the test procedure occurs in the EUT and is reported	From EUT to master controller
Watchdog	The controller watchdog puts this signal on the bus when it is overlooked by its controller (to avoid software error)	To the function module to which an error signal applies
Global start trigger with delay function	Any function unit or external instrument can generate this signal, or an external instrument receives a trigger-to-scope signal	To/from the active function module, the SC and MC
Sync1 to Sync3	Three freely definable synchronization bus signals	Freely definable, for later options

7 THE STANDARD USER INTERFACE (SUI)

The NSG 3060 Standard User Interface (SUI) consists of

– A 7" color touch panel
– A wheel for setting parameters
– A wheel sensitivity keys labeled 1, 10, and 100 to denote the units
– A Start key (show symbol) to start tests
– A Stop key (show symbol) to stop tests
– A Pause key (show symbol) to pause tests

NSG 3060 touch screen, keys and wheel

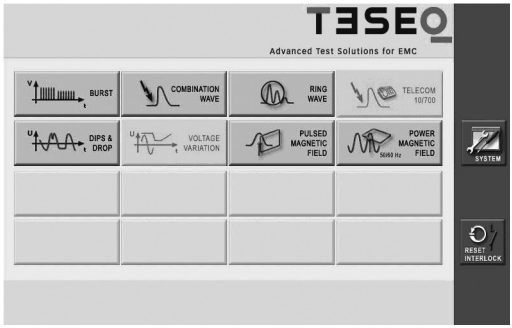
CAUTION – Never use a metal, sharp or pointed tool for touching the panel. Use a soft towel for cleaning. Never use aggressive cleaning liquids.

As soon the unit is powered and switched on, the boot procedure starts (approx. 30 seconds) and the Start menu is displayed.

TESEQ
Advanced Test Solutions for EMC
ESD simulators
compact, user-friendly, and ready for tomorrow's standards
Air and contact discharge operation 200V to 30kV
Touch screen display & battery-powered
Compliant with industry standards (IEC, ANSI, SAE, ISO, etc.)
Interchangeable and moulded network modules
Adjustable discharge detection
ISO self-test function
Loading system parameters, please wait

SUI boot-up screen

7.1 Main menu



Main menu

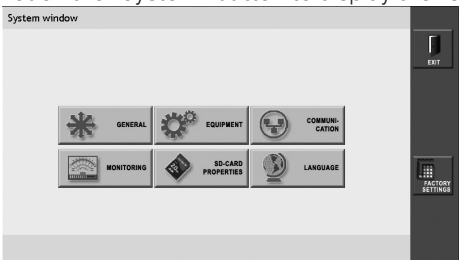
The main menu is displayed following boot-up. The main menu shows the possible pulses or tests which are available to the user, depending on the NSG 3060's configuration. Faded generator icons (Telecom 10/700 us pulse and voltage variation) mean, that the generator is configured to generate those pulses but the proper unit is not connected.

The empty buttons are reserved for future applications.

In the red bar there are two buttons, "System" and "Reset Interlock". Touching the Reset interlock button will close the interlock. The interlock must be closed before starting a test.

7.2 System window

Touch the “System” button to display the “System” window:



System window

The “System” window displays 6 buttons: General, Equipment, Communication, Monitoring, SD-card properties and language. In the red bar there are two buttons: Factory settings and exit.

FACTORY SETTINGS

Touch the “Factory settings” button to reset the properties associated with each of the buttons in the “system” window to the original factory settings.

EXIT

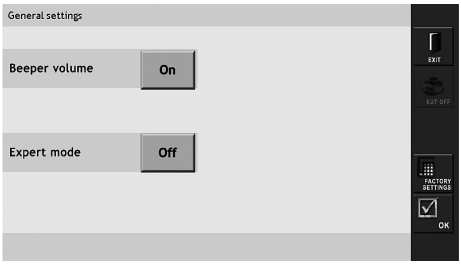
Touch the “Exit” button to return to the main menu.

REMOTE

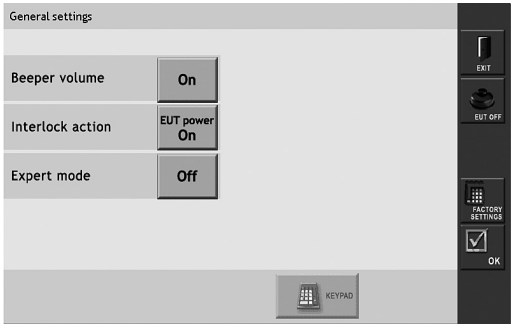
Touch “Remote” button to enter remote controlled screen. No inputs via touch panel are possible. The NSG can now be controlld via WIN 3000 remote control software. Touch “Exit” on screen and in WIN 3000 to use NSG manually.

7.3 General settings

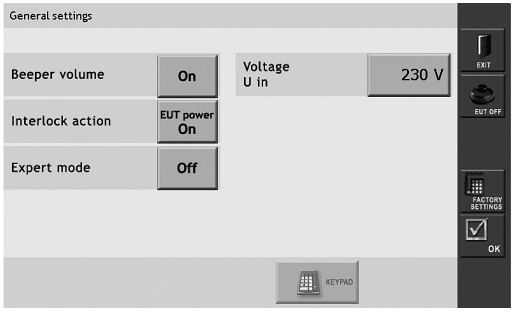
Touch the “General” button to display one of the following windows:



General settings window with no optional hardware (CDN, variac, etc.) connected.



General settings window with optional EUT switch connected



General settings window with optional automated variac connected

Beeper volume

During the surge test there is a beep sound to alert the user. Touch the “beeper volume button” (“On” in the example) to switch the sound on and off.

The red vertical bar on the right side of the General settings window displays 4 buttons: “Exit”, “EUT OFF/ON”, “Factory Settings”, and “OK”.

EXIT

Touch the “Exit” button to return to the system window without saving settings.

EUT OFF/ON
When the NSG 3060 is powered on, the EUT power is automatically set to "OFF". Touch the "EUT OFF/ON" button to turn power to the EUT on or off.

FACTORY SETTINGS
Touch the "Factory settings" button to reset the properties associated with each of the buttons in the General settings window to the original factory settings.

OK
Touch the "OK" button to save all settings and return to the system window.

Interlock action
Touch the "Interlock action button" ("EUT Power on" in the example) to keep EUT power on when the interlock is activated, or to have it automatically shut off (EUT Power off) when the interlock is activated.

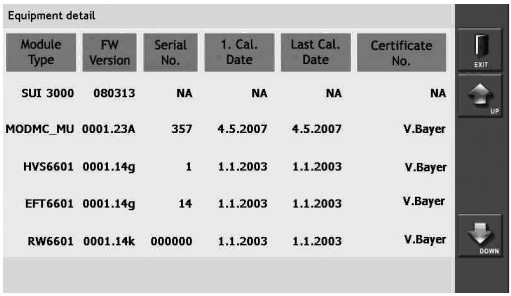
Expert mode
Touch the "expert mode" button ("Off" in the example) to "Active" to change parameters during a running test. When the button is set to "Off" parameters can be changed only when the NSG 3060 is in stop mode. Expert mode only; available for burst pulse (FFT).

Voltage Uin
This button is used only when an optional VAR 6502 or VAR 3005 variac is connected to the NSG 3060. The value entered in this field is the voltage measured at the mains socket and is used as the 100% reference point for voltage variation tests.

Touch the "voltage Uin" button ('230" in the example). Use the wheel or keypad to set the input voltage.

Uin setting will be saved and is valid for all following tests. Uin are changeable via WIN 3000 (dialoge) to be used in sequence mode.

7.4 Equipment



Equipment window

Touch the “Equipment” button to access a list of all internal and external generator modules, including firmware versions, serial numbers, calibration dates and certificate numbers.

The red vertical bar on the right of the equipment window displays three buttons: “Exit”, “Up” and “Down”.

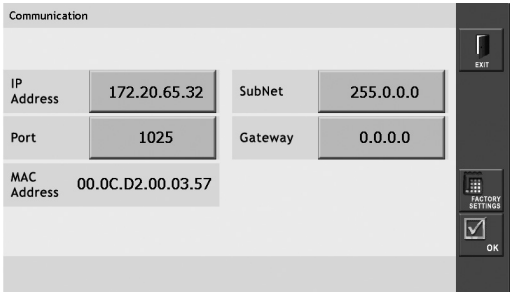
EXIT

Touch the “Exit” button to return to the system window.

UP/DOWN

If the system includes more than 5 modules, touch the “Up” and “Down” arrows to scroll through the list.

7.5 Communication



Communication window

Touch the “Communication” button to view and enter the network address information required to integrate the NSG 3060 into a local area network or connect it to a PC.

By touch the IP address-, SubNet-, Port- or Gateway-field the key board will appear and the new numbers can be added. To enter a new address only the number key and the dot may be used.

After touching “ENTER” the keypad will close and the new setting are saved. The “Delete” key will delete all text entered. The backspace button (<--) will delete the last letter entered. Touch the “Cancel” button to return to the test parameter window without saving the file.

IP address
An IP address (Internet protocol address) is a unique address that certain electronic devices use identify and communicate with each other on a computer network utilizing the Internet Protocol standard (IP). Any participating network device must have its own unique address. Touch the “IP address” button to enter the IP address. A red frame will be displayed around the field. Enter the IP address using the wheel or keypad.

Subnet
A subnet is a logical grouping of connected network devices which is used to partition networks into segments. Devices on a subnet are share a contiguous range of IP address numbers.

A subnet mask defines the boundaries of an IP subnet and hides the network address portion of an IP address. For example, if a network has a base IP address of 192.168.0.0 and has a subnet mask of 255.255.255.0, then any data going to an IP address outside of 192.168.0.X will be sent to that network’s gateway.

The correspondence between subnet masks and IP address ranges follows defined mathematical formulas, by assigning a value of 1 to every digit in the network address portion of the binary IP address. These masked digits are not permitted to change when assigning IP addresses to devices on the local area network.

Touch the “SubNet” button to enter the subnet mask. A red frame will be displayed around the field. Enter the subnet mask using the wheel or keypad.

Gateway

A gateway is a node on a network that serves as an entrance to another network. In enterprises, the gateway is the computer that routes the traffic from a workstation to the outside network that is serving the Web pages. In homes, the gateway is the ISP that connects the user to the internet

In enterprises, the gateway node often acts as a proxy server and a firewall. The gateway is also associated with both a router, which use headers and forwarding tables to determine where packets are sent, and a switch, which provides the actual path for the packet in and out of the gateway.

The gateway address is usually set at 0.0.0.0. Touch the “Gateway” button to enter the gateway address. A red frame will be displayed around the field. Enter the gateway address using the wheel or keypad.

Port

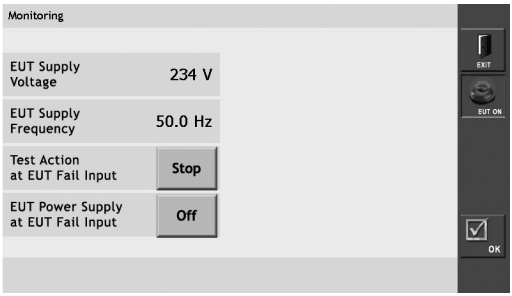
Network ports can be either physical or virtual connection points. The NSG 3060 has a physical Ethernet port that allows it to be connected to a PC or router.

The port address for the NSG 3060 should be set to 1025. Touch the “Port” button to enter the port number. A red frame will be displayed around the field. Enter the port number using the wheel or keypad.

MAC address

Media Access Control (MAC) technology provides a unique identification and access control for devices on an IP network. This address can not be changed. Media Access Control assigns a unique number, the MAC address, to each network adapter. The MAC address for the NSG 3040 network interface card, displayed in the communication screen, is unique to that card and cannot be changed.

7.6 Monitoring



Monitoring window

Touch the “Monitoring” button to view EUT power input parameters, and to control test activity and EUT power input in the event of EUT failure.

7.6.1 EUT supply voltage, EUT supply frequency

The EUT supply voltage/EUT supply frequency fields display the actual EUT voltage/frequency when the AC EUT input supply is connected and EUT power is switched “On”. When the input supply is not connected and/or the EUT is switched off, these fields will display 0 V and 0 Hz.

Thereby the EUT (AC) input supply must be connected and the EUT power has to be switched “On”. Otherwise the screens show 0 V and 0 Hz.

7.6.2 Test action at EUT fail input

Touch the Test action at EUT fail input button (“Stop” in the example) to specify the test action taken if the EUT fail signal is deledted.

When the button is set to “Stop” and the EUT fails, the test stops. The test can be restarted by pressing the Start key on the front panel.

When the button is set to “Pause” and the EUT fails, the test goes into pause mode. The test can be continued by pressing the “Start” key on the front panel. When the button is set to “CONT.”, the test will continue even if the EUT stops functioning.

7.6.3 EUT power supply at EUT fail input

Touch the EUT power supply at EUT fail Input button ("Off" in the example) to specify the action taken if an EUT fail signal is generated.

When the button is set to "On" EUT power stays on after the EUT fail signal is generated.

When the button is set to "Off" EUT power shuts down when the EUT fail signal is generated.

7.6.4 Exit

Touch the "Exit" button to return to the system window without saving changes.

7.6.5 EUT on

This button displays the EUT input power status.

7.6.6 Ok

Touch the "Ok" button to save changes and return to the system window.

7.7 SD-card properties

This feature is not yet implemented.

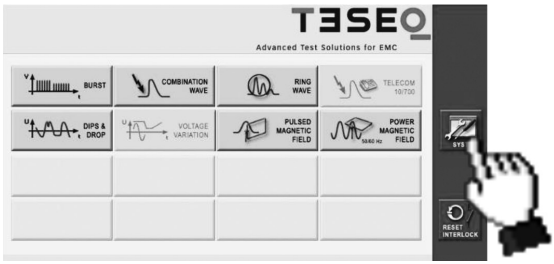
SD-card properties window

The NSG 3060 includes an integrated SD-card slot which can be used to download software updates.

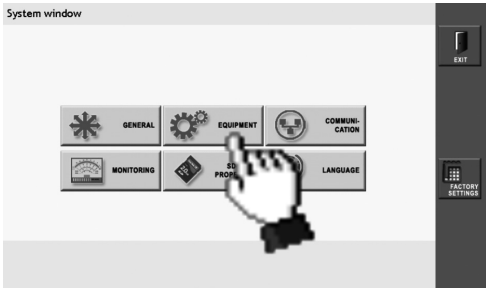
7.7.1 Viewing the current SUI version

The current SUI software version is displayed in the equipment detail window. To access this window.

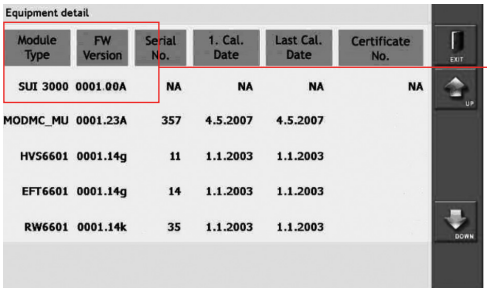
1. Touch the system button in the main menu to display the system window.
2. Touch the equipment button to display the equiment detail list.



System button in the main menu



Equipment button in the system window



Identifies the SUI version

Equipment detail list with SUI software version displayed

7.7.2 Updating SUI software via the SD-card

To change the SUI software, first switch off the generator and remove all power cords and cables. Open the top housing cover of the generator as described below.

WARNING - Before opening the generator make sure that it is turned OFF and disconnected from all power and signal cables!

To open the NSG 3060, the user must first remove the sides panels. Each side panel has 4 snap fixtures which will separate when outward pressure is applied.

1. Pull outward on the indentation in the front of the side panel. A blunt tool which will not scratch the paint on the panel may be used.

2. Pull outward to separate the panel from the snap fixtures.

3. Remove the upper screws on both sides of the generator cover.

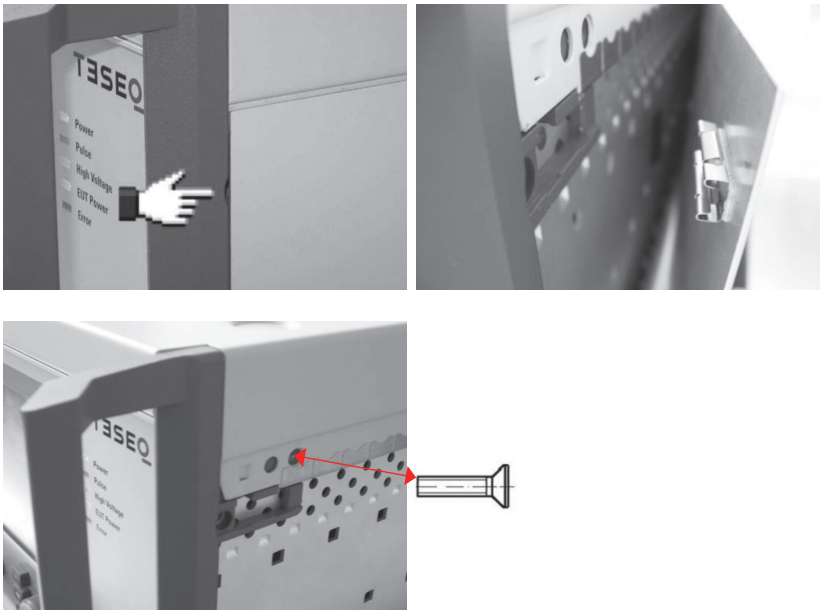
4. Remove the NSG 3060 cover. The SD-card slot is located at the right front of the generator, in back of the front panel.

5. Press the SD-card to release it. Remove the card from the slot. To install a new SD-card, proceed to step 7.

6. To download new software from a PC to the SD card, insert the card in the SD port of the PC and copy the software to the SD card. The file name must remain SUI3000AP.EXE. Remove the SD card from the PC.

7. Insert the SD-card in the NSG 3060. Follow steps 1 - 4 in reverse to replace the generator cover and side panels.

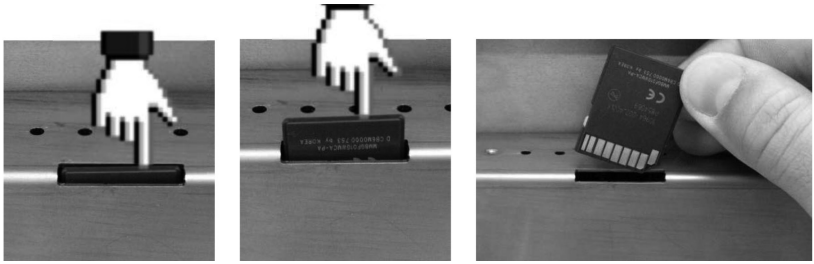
8. Restart the NSG 3060. The new software version will boot automatically and may be verified in the equipment detail window (see section 7.7.1).



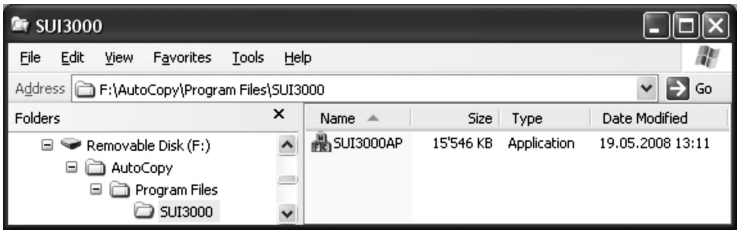
Removing the NSG 3060 side panels and cover

The SD-card is placed on the upper right position.

NSG 3060 SD-card slot



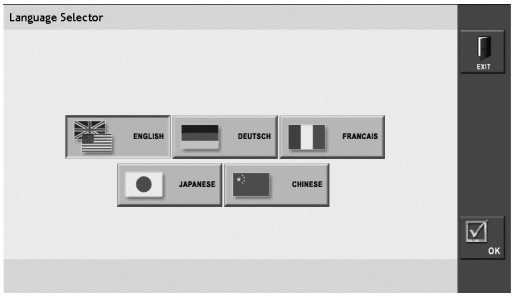
Removing the SD-card



Windows explorer displaying the SUI program filename (SUI3000AP.EXE) on the SD-card (removable disk (F:))

NOTE: Do not change the SUI program filename.

7.8 Language



Language selector window

Touch the “Language” button to open the language selector window. The SUI software can be displayed in English, German, French, Japanese or Chinese. (Note: Only English is available at this time).

The NSG 3060 will automatically reboot if the language is changed.

OK
Touch the “OK” button to save all settings and return to the system window.

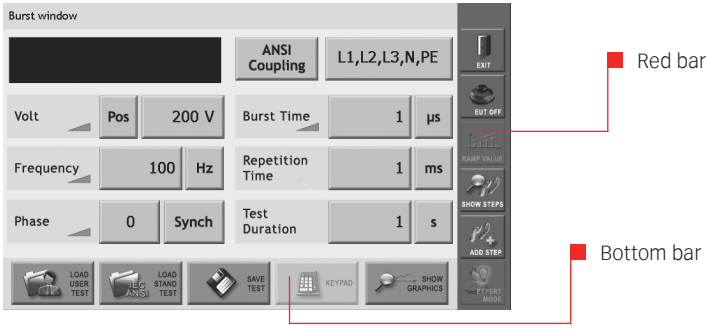
EXIT
Touch the “Exit” button to return to the system window without saving settings.

8 SETTING TEST PARAMETERS

The main menu displays a button for every type of test that can be performed by the NSG 3060. Buttons for tests that are not available on the system as configured are grayed out.

The user can set parameters for available tests and create new tests in the test parameter window.

Figure 8.1 shows the test parameter window for burst tests. While the input fields differ for each type of test, the red side bar and bottom bar remain the same.



Example of the burst test window, showing the red bar and bottom bar.

8.1 The red menu bar

EXIT

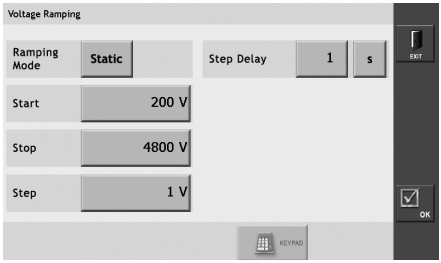
Touch the “Exit” button to return to the system window without saving settings.

EUT OFF/EUT ON

Touch the "EUT Off/EUT On" button to switch EUT power off or on. Note: the EUT can work only in combination with an automated accessory, such as a variac, step transformer or automated CDN.

RAMP VALUE

The "Ramp value" button is active only if a rampable parameter in the test window is selected. All rampable parameters are identified by a small gray ramp icon. This icon will turn red when a parameter is ramped.



Ramping window for voltage parameter

- Ramping mode — Touch the "Ramping mode" button ("Static" in the example) to change the ramping mode from static to linear. In linear mode the user can set Start, Stop and Step values.
- Start — Touch the "Start" button ("200 V" in the example). A red frame is displayed around the field. Enter the Start value using either the wheel or the keypad.
- Stop — Touch the "Stop" button ("4800 V" in the example). A red frame is displayed around the field. Enter the Stop value using either the wheel or the keypad.
- Step — Touch the "Step" button ("1 V" in the example). A red frame is displayed around the field. Enter the Step value using either the wheel or the keypad.

- Step delay — Touch the “Step delay” button (“1” in the example). A red frame is displayed around the field. Enter the Step Delay value using either the wheel or the keypad Touch the “Unit” button (“s” in the example) to set the step delay unit.
  The step delay depens on pulses and the minimum repetition rates.

OK
Touch the “OK” button to save all settings and return to the test parameter window.

EXIT
Touch the “Exit” button to return to the test parameter window without saving settings.

SHOW STEPS
Touch the “Show Steps” button to view, change the order of, or delete individual test steps. The show step window displays individual test steps in the order that they will be executed.

- **UP/DOWN**
  Use the “UP” and “DOWN” arrows on the right side of the Show Step window to change the test step order. Touch a line number to select a step. A red frame is displayed around the selected step. Touch the “UP” button to move the step up in the list. Touch the “DOWN” button to move the step down in the list.

- **DEL**
  Touch a line number to select a step. A red frame is displayed around the selected step. Touch the “DEL” button to delete the step.

- **OK**
  Touch the “OK” button to save all settings and return to the test parameter window.

- **EXIT**
  Touch the “Exit” button to return to the Test parameter window without saving settings.

ADD STEP

Multi-step tests can be programmed manually in the test parameters window using the “Add Step” button.
Touch the “Add Step” button create a new step with the values currently displayed in the Test parameters window The user can program a maximum of 10 test steps.

When the first test step is programmed, “TEST 1/X” is displayed in the upper right corner, and the step can no longer be changed from the Test parameters window.

To change a step, the user must first delete it using the “Show Step” button, then use “Add Step” to re-enter the step.

Refer to sections 8.3 - 8.9 for detailed information on setting parameters for specific types of tests.

EXPERT MODE

The “Expert Mode” button can be used only if “Expert Mode” is set to “On” in the System/General settings window (see section 7.3) Expert Mode is a fast, effective method of activating critical threshold values.

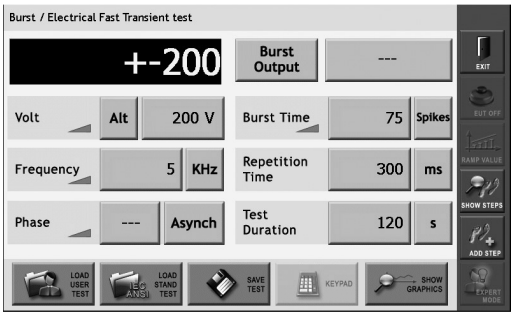
Touch the “Expert Mode” button to manually adjust test parameters using the wheel while a test is in progress.

“Expert Mode” only for burst pulse

The “Expert Mode” allows the user to change parameters during a running test if this mode is set “Active” in the system setting. For safety reasons in the in the burst menu the expert mode needs to be activated as well.

The “Expert Mode” can be activated only for the following parameter:

- Volt (please note, the voltage change is only possible if the polarity is set to Neg. or Pos.)
- Frequency
- Phase
- Burst time



A selected test can be started. During run mode the changeable parameter can be touched, the value window is highlighted with a red frame, like the voltage frame shown in the examples above. The value can now be changed via wheel and by pressing again the “START” button, the value will be accepted and on the pulse output the new value is displayed.

8.2 The bottom bar

Following functions are not available in this version:

8.2.1 LOAD USER TEST

Touch the “Load User Test” button to display a list of all test files that have been created and saved by the user. Only files for the selected test type are displayed. Figure 8.5 shows the load user test window with several burst tests displayed.

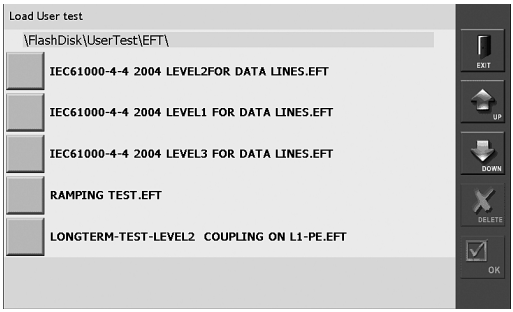
The user can scroll through the tests by touch the “UP” and “DOWN” arrows on the right side of the screen to scroll through the tests.

Touch the button to the left of the test name to select it. A red border is displayed around the selected test. Figure 8.6 shows the Load User Test window with a test selected.

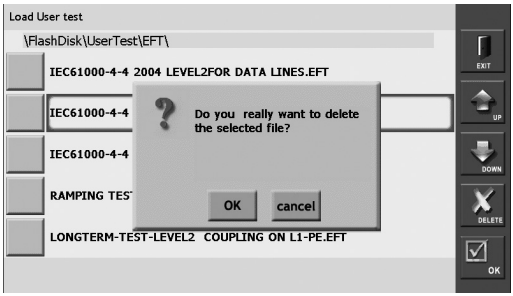
Touch the “OK” button to load the test and return to the test parameter window.

Touch the “Delete” button to delete a saved test. A window asking the user to confirm or cancel this action will be displayed (see figure 8.7). Touch “OK” to delete the file, or “Cancel” to cancel this action.

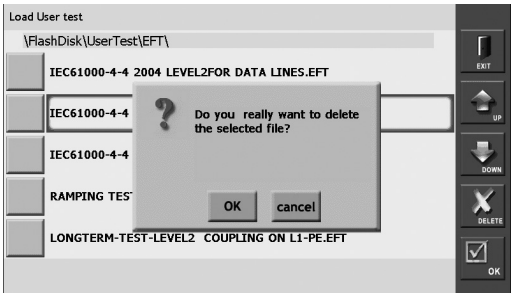
NOTE: Once a test has been deleted it cannot be restored.



Load user test window



Delete test confirmation window



Delete test confirmation window

8.2.2 LOAD STANDARD TEST

The NSG 3060 includes European generic standards from the IEC/EN 61000-4-x and ANSI/IEEEE C62.41 which are conform to many standard derivates and product standards.

Depending on selected pulse the appropriate IEC or ANSI standard test can be selected. A complete list can be found in section “Standard test parameter”.

Following standard tests are in the SUI

Burst, IEC 61000-4-4; 2009 Ed2 and ANSI
1-Phase power lines level 1 up to level 4
3-Phase power lines level 1 up to level 4
Capacitive coupling clamp lines level 1 up to level 4

Combination wave, IEC 61000-4-5 2005_Ed_2
1-Phase power lines L-N coupling level 1 up to level 4
1-Phase power lines L-PE coupling level 1 up to level 4
1-Phase power lines N-PE coupling level 1 up to level 4

3-Phase power lines Lx-Lx coupling level 1 up to level 4
3-Phase power lines Lx-PE coupling level 1 up to level 4

DC-Line L-N coupling level 1 up to level 4
Unshielded unsymmetrical I/O lines level 1 up to level 4
Unshielded symmetrical communication lines level 1 up to level 4

Combination wave, ANSI C62.54, 2002
1-Phase EUT, Basic 1, Location Cat. A1 up to Cat. A3
1-Phase EUT, Basic 2, Location Cat. A1 up to Cat. A3

3-Phase EUT, Basic 1, Location Cat. A1 up to Cat. A3
3-Phase EUT, Basic 2, Location Cat. A1 up to Cat. A3
3-Phase EUT, Basic 3, Location Cat. A1 up to Cat. A3
3-Phase EUT, Basic 4, Location Cat. A1 up to Cat. A3

Ring wave, IEC 61000-4-12,
1-Ph Power Lines L-N, major feeder line, 12 Ω, level 1 up to level 4
1-Ph Power Lines L-PE, major feeder line, 12 Ω, level 1 up to level 4
1-Ph Power Lines N-PE, major feeder line, 12 Ω, level 1 up to level 4

1-Ph Power Lines L-N, outlet line, 30 Ω, level 1 up to level 4
1-Ph Power Lines L-PE, outlets line, 30 Ω, level 1 up to level 4
1-Ph Power Lines N-PE, outlets line, 30 Ω, level 1 up to level 4

3-Ph Power Lines Lx-Lx, major feeder line 12 Ω, level 1 up to level 4
3-Ph Power Lines Lx-Lx, outlets line, 30 Ω, level 1 up to level 4
3-Ph Power Lines Lx-PE, Comm. Mode, major feeder line 12 Ω, level 1 up to level 4
3-Ph Power Lines Lx-PE, Comm. Mode, outlets lines, 30 Ω, level 1 up to level 4

DC Lines, L1=Pos.; N=Neg. 12 Ω, level 1 up to level 4
DC Lines, L1=Pos.; N=Neg. 30 Ω, level 1 up to level 4

Unshielded, unsymmetrical I/O lines, level 1 up to level 4
Unshielded symmetrical lines, communication lines, level 1 up to level 4

Ring wave, ANSI C.62.45,2002
1-Phase EUT, Basic 1, Location Cat. A1 up to Cat.A3, 12 Ω
1-Phase EUT, Basic 1, Location Cat. A1 up to Cat.A3, 30 Ω

1-Phase EUT, Basic 2, Location Cat. A1 up to Cat.A3, 12 Ω
1-Phase EUT, Basic 2, Location Cat. A1 up to Cat.A3, 30 Ω

3-Phase EUT, Basic 1, Location Cat. A1 up to Cat.A3, 12 Ω
3-Phase EUT, Basic 1 Location Cat. A1 up to Cat.A3, 30 Ω

3-Phase EUT, Basic 2, Location Cat. A1 up to Cat.A3, 12 Ω
3-Phase EUT, Basic 2, Location Cat. A1 up to Cat.A3, 30 Ω

3-Phase EUT, Basic 3, Location Cat. A1 up to Cat.A3, 12 Ω
3-Phase EUT, Basic 3, Location Cat. A1 up to Cat.A3, 30 Ω

3-Phase EUT, Basic 4, Location Cat. A1 up to Cat.A3, 12 Ω
3-Phase EUT, Basic 4, Location Cat. A1 up to Cat.A3, 30 Ω

Telecom pulse, IEC 61000-4-5 2005_Ed_2
Symmetrical operated all lines to PE, level 1 up to level 4
Shielded I/O communication lines, level 1 up to level 4

Power magnetic field, IEC 61000-4-8 2001_Ed_1.1
50 HZ CF 9.8, level 1 up to level 4
60 HZ CF 9.8, level 1 up to level 4

Pulsed magnetic field, IEC 61000-4-9 2001_Ed_1.1
CF 0.98, level 3 up to level 5

Dip and Interrupts for AC power lines, IEC 61000-4-11 2002_Ed_2
50 Hz, AC Power Lines, Class 2, Dips, 0%, 0.5 Cycle dips up to 25 Cycle

60 Hz, AC Power Lines, Class 2, Dips, 0%, 0.5 Cycle dips up to 30 Cycle

50 Hz, AC Power Lines, Class 3, Dips, 0%, 0.5 Cycle dips up to 250 Cycle

60 Hz, AC Power Lines, Class 3, Dips, 0%, 0.5 Cycle dips up to 300 Cycle

50 Hz, AC Power Lines, Class 2, Short interruption, 0%, 250 Cycle dips
50 Hz, AC Power Lines, Class 3, Short interruption, 0%, 250 Cycle dips
60 Hz, AC Power Lines, Class 2, Short interruption, 0%, 300 Cycle dips
60 Hz, AC Power Lines, Class 3, Short interruption, 0%, 300 Cycle dips

50Hz Voltage variation
60Hz Voltage variation

Dips and interrupts for DC lines, IEC 61000-4-29 2000
DC Voltage Dips 40%, 0.01 s up to 1 s
DC Voltage Dips, 70%, 0.01 s up to 1 s

DC voltage interruption, 0%, 0.001 s up to 1 s

DC voltage variation, 85%, 0.1 s up to 10 s
DC voltage variation, 120%, 0.1 s up to 10 s
DC voltage variation, 80%, 0.1 s up to 10 s

8.2.3 SAVE TEST

The "Save Test" button is used to save the current test to a file for later use.

Touch the "Save Test" button. A keyboard is displayed. Touch the individual keys to enter a file name in the black bar above the keyboard.

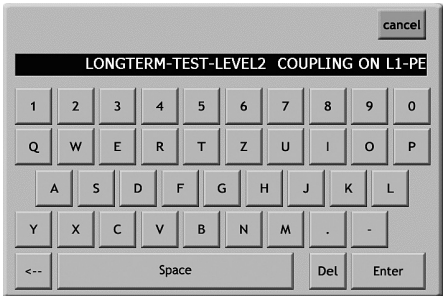
The "Delete" key will delete all text entered. The backspace button (<--) will delete the last letter entered. Touch the "Enter" button to save the file under the name entered.

All letters and numbers, as well as hyphens, spaces and dots, can be used in file names. The maximum file name is 40 characters, including spaces.

The system automatically generates a file extension to identify the type of test. For example, all burst tests will are given the extension .EFT.

Touch the "Cancel" button to return to the test parameter window without saving the file.

Save Test keyboard



Keyboard with filename entered

KEYPAD

Touch the “Keypad” button to display a numeric keypad. The Keypad button is active only when the user has selected a parameter that requires a numeric entry.

Touch individual numbers to enter them, touch “C” to clear an entry, and touch “Enter” to enter the value in the field. After touching “Enter” the keypad will close.

Keypad

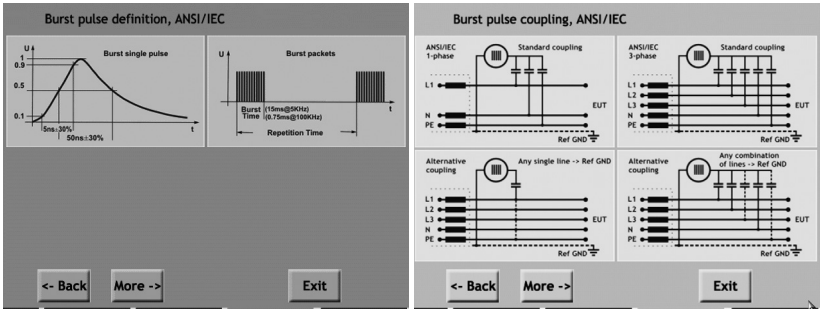
SHOW GRAPHICS

Touch the “Show Graphics” button to display waveforms, coupling diagrams and other graphical information for the selected test.

Touch the “More” button to view additional information.

Touch the “Back” button to view previous graphics.

Touch the “Exit” button to return to the Test parameters window.



Example burst pulse graph

8.3 Burst parameter setting

The generation of high voltage bursts and high frequency pulses is part of the EFT/burst package test required in the international standard EN/IEC 61000-4-4.

The test NSG 3060 generates bursts of interference that simulate the interference that is generated when inductively loaded switches are operated. With their very steep rising and falling edges, these interference pulses spread over a frequency spectrum of over 300 MHz and may occur wherever electrical currents are switched off in connection with motors, circuit breakers, relays, fluorescent lamps, etc. Therefore, nearly all the relevant standards concerning the testing of electronic equipment require the performance of burst tests.

8.3.1 Test configuration with power line coupling

In a power line coupling test, the NSG 3060 generates the interference signal, which is superimposed on the EUT power signal.

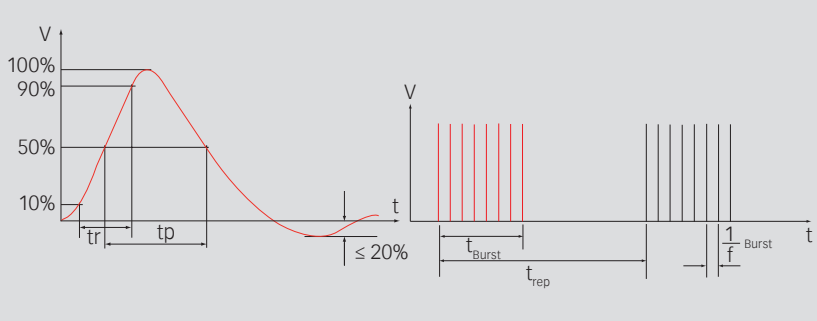
8.3.2 Test configuration with external coupling

In an externally coupled test, the interference signal is delivered through the NSG 3060's coaxial burst output connector on the front panel and fed to an external coupling clamp. The signal is then applied to signal or data line cables.

The same SHV type connector may also be used for connection of a 3-phase CDN or for a CDN suitable for 1-phase >16 A and all other CDNs.

NOTE - A Teseq CAS 3025 calibration set must be used with a minimum 400 MHz digital oscilloscope to accurately verify the EFT pulse parameters.

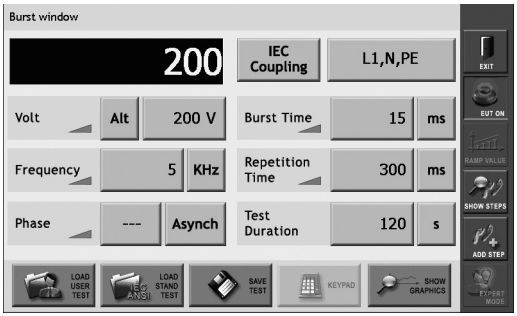
Single pulse **Pulse burst**



Burst wave shape and timing definitions

tr = 5 ns ± 30%
tp = 50 ns ± 30% into 50 Ω
tp = 50 –15 ns / +100 ns into 1000 Ω

8.3.3 Burst parameters window



Burst parameter setting window

8.3.4 Voltage

Touch the "Polarity" button (ALT in the example) to select test polarity. Polarity values are: **positive (POS), negative (NEG),** or **alternating (ALT).**

On odd pulse number there will be one pulse less in negative then in positive. Positive pulse will be first executed.

Touch the "Voltage" button (200 V in the example) to enter the test voltage. A red frame is displayed around the field. The voltage value may be entered using the wheel or the keypad.

8.3.5 Frequency

Touch the "Frequency" button (5 in the example) to set the test frequency. A red frame is displayed around the field. The frequency value may be entered using the wheel or the keypad.

Touch the units button (KHz in the example) to set the frequency unit. Frequency values are Hz and KHz.

8.3.6 Phase

Touch the Synch/Asynch button (Asynch in the example) to activate the synchronization of test pulses to the EUT mains frequency.

When this button is set to Asynch, the phase value button (--- in the example) will display '---'. When this button is set to Synch, the user must also set the phase value.

To set the phase value, touch the phase value button. A red frame is displayed around the field. The phase value may be entered using the wheel or the keypad.

The value is in degree units and may range from 0 to 359.

8.3.7 Coupling

Touch the "Coupling mode" button (IEC COUPLING in the example) to select **BURST OUTPUT**, **MANUAL CDN, ANSI COUPLING** or **IEC COUPLING.**

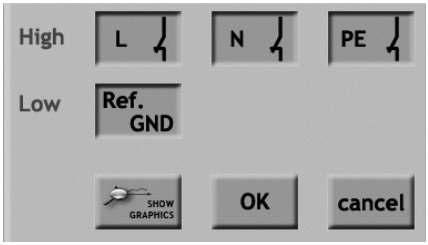
Burst output
Burst output must be selected if an external capacitive coupling clamp (e.g. CDN 8014/8015) is connected to the NSG 3060.

Manual CDN
The factory setting for manual CDN is the same as for burst output.

ANSI and IEC coupling
In burst testing it does not matter if ANSI or IEC coupling mode is selected, since the ANSI standard refers to IEC/EN 61000-4-4. Touch the coupling line selection field (L1, N, PE in the example) to display the coupling selection window.

Touch the individual "high output coupling line" buttons (L, N, and PE in the example) to select an open or closed relay.

The "Low output" field (Ref. ground in the example) is always fixed.
Touch "OK" to enable the coupling selection and close the window.
Touch "Cancel" to close the window without saving the coupling selection.
Touch "Show Graphics" to display a graphical example of the coupling selection.



Coupling selection window

Note: Burst coupling is always to HF reference ground.

8.3.8 Burst time
Touch the "burst time" button (15 in the example) to set the burst time. A red frame is displayed around the field. The burst time may be entered using the wheel or the keypad.

Touch the “units” button (ms in the example) to set the time unit. Time units are **s, ms, µs** and **spikes.**

8.3.9 Repetition time

Touch the “Repetition time” button (300 in the example) to set the test repetition time. A red frame is displayed around the field. The repetition time may be entered using the wheel or the keypad.

Touch the “units” button (ms in the example) to set the time unit. Time units are **s** and **ms**.

8.3.10 Test duration

Touch the “Test Duration” button (120 in the example) to set the test duration time. A red frame is displayed around the field. The duration time may be entered using the wheel or the keypad.

Touch the “units” button (s in the example) to set the time unit. Time units are **s, min, h** and **cont (continuous).**

8.3.11 Burst generator technical data

Parameter	Value
Pulse amplitude:	± 200 V to 4.8 kV (in 1 V steps) - open circuit ± 100 V to 2.4 kV (50 Ω matching system)
Voltage step:	1 V/ 10 V / 100 V
Polarity:	Positive / negative / alternate
Frequency:	Hz: 100 ... 99’999 kHz: 1 ... 1’000
Phase:	Asynchronous, synchronous 0° to 359° (in 1° steps)
Coupling:	ANSI / IEC / external / manual
Burst time:	µs: 1 ... 99’999 ms: 1 ... 99’999 s: 1 ... 1’999 Spike: 1 ... 1000

Repetition time:	ms:	1 ... 99'999
	s:	1 ... 4'200 (70 min)
Test duration:	s:	1 ... 99'999
	min:	1 ... 99'999
	h:	1 ... 1'000
	Continuous	

8.3.12 Derating

Some parameter combinations will not be accepted due to the power limitation of the HV power supply. The following error message will be displayed when an invalid combination of parameters is entered:

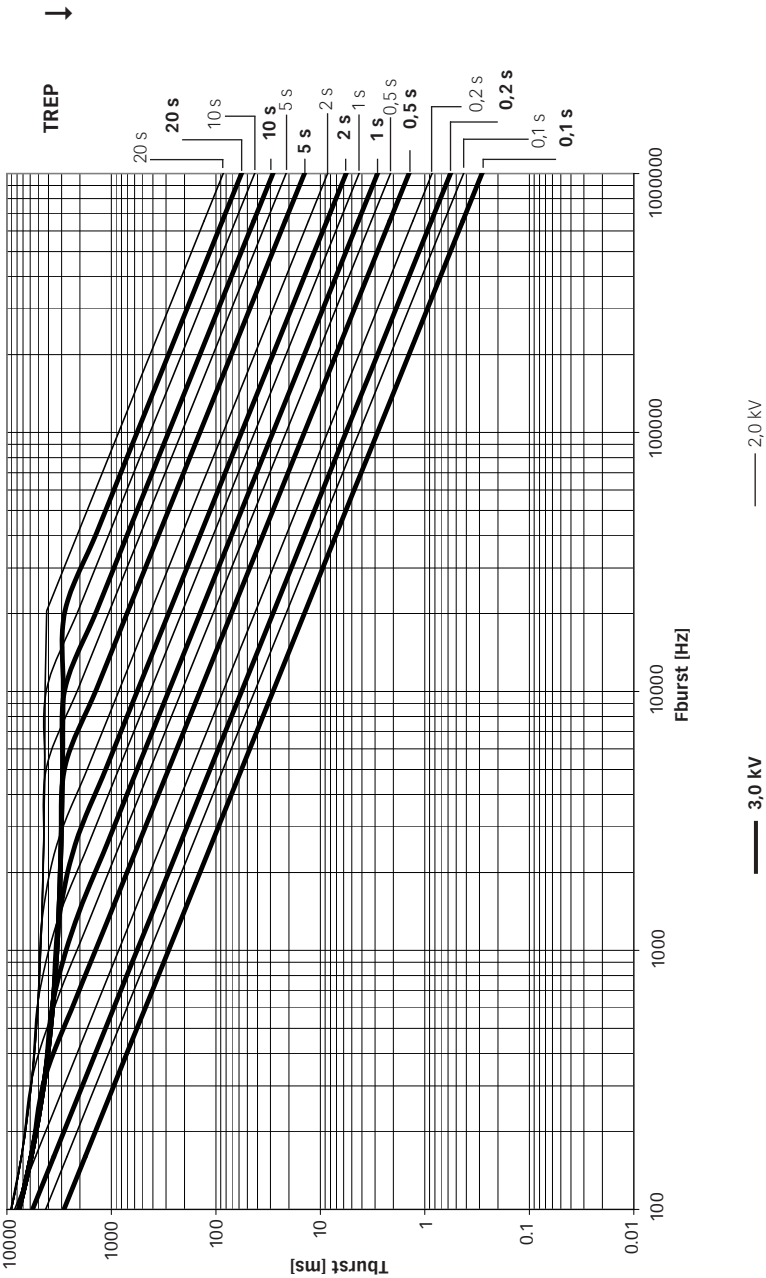
Invalid parameter error message

The following graphs show the relationship between voltage, trep, tburst and frequency, and show the range of possible parameter combinations that can be used in testing.

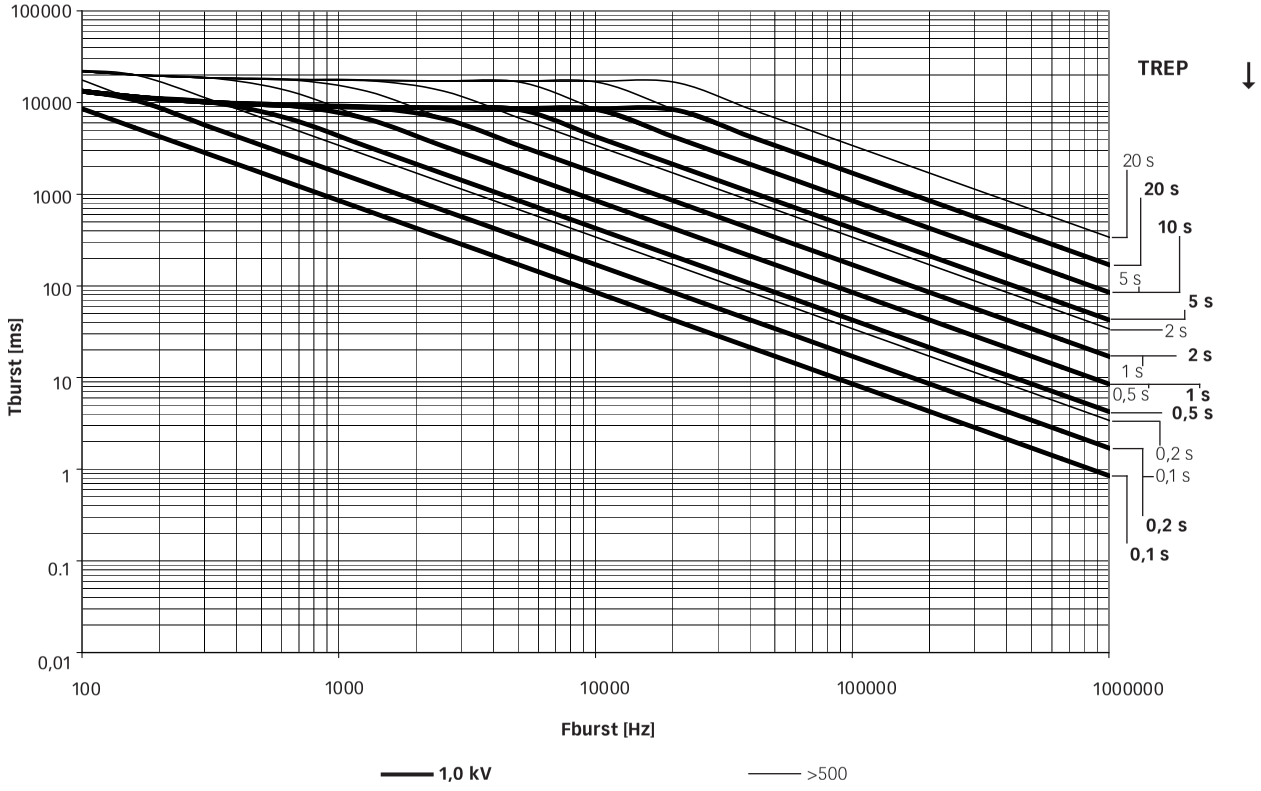
Each graph includes two voltage settings which are shown in different line thicknesses in relation to the trep values given for 20, 10, 5, 2, 1, 0.5, 0.2 and 0.1 ms. The appropriate trep value (bold trep for the bold line) are labeled on the border of the graph. Combinations of values that are below the line are allowed.

TESEQ

Advanced Test Solutions for EMC



NSG 3060 EMC test system


100000
10000
1000
100
10
1
0.1
0,01
Tburst [ms]
100
1000
10000
100000
1000000
Fburst [Hz]
TREP
20 s
20 s
10 s
5 s
5 s
2 s
2 s
1 s
1 s
0,5 s
0,5 s
0,2 s
0,1 s
0,2 s
0,1 s
1,0 kV
>500

8.4 Combination wave (Surge) parameter setting

The surge test generates high voltage pulses as specified in the international standards EN/IEC 61000-4-5 and ANSI C62.41.

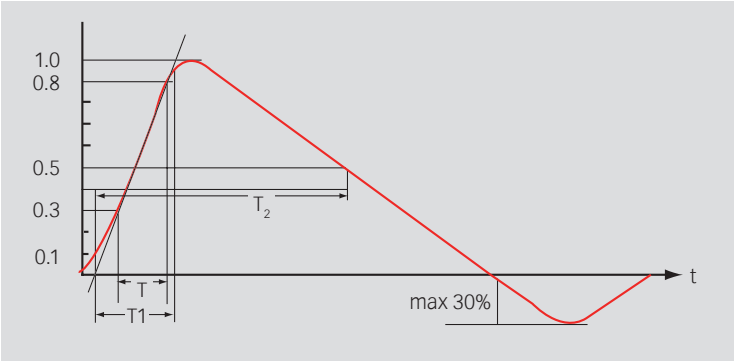
8.4.1 Test configuration for power line coupling

Test pulses are injected directly into the EUT power supply lines as they pass through the mains CDN 306x. The EUT obtains its power from the EUT power outlet on the front panel of the CDN where the mains voltage has the interference signal superimposed on it.

8.4.2 Test configuration for external coupling

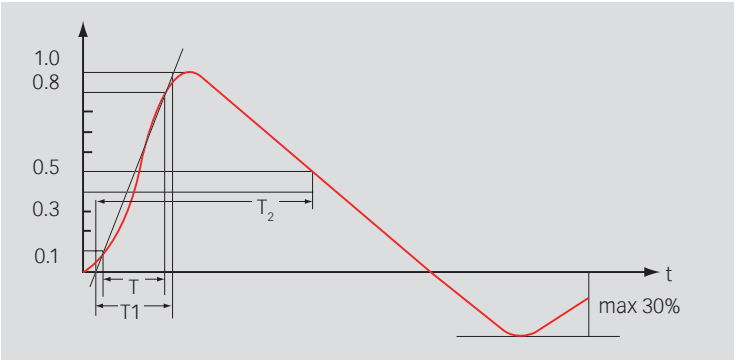
In this mode, the interference pulses are switched to the surge Hi and Lo output sockets on the front panel, to which an external data line signal coupler can be connected. By using such an external signal coupler it is possible to superimpose the interference signal, as specified in the standards, on communication cables and other kinds of data lines.

The same coaxial HV output sockets may also be used for connection to all other CDNs.



Front time T1 = 1.67 x T = 1.2 µs ± 30%
Time to half value T2 = 50 µs ± 20%

Wave shape of open circuit voltage (1.2/50 µs), wave shape definition according to IEC/EN 61000-4-5.

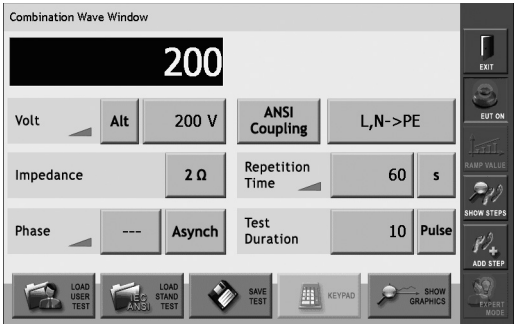


Front time T1 = 1.25 x T 8 = µs ± 20%
Time to half value: T2 = 20 µs ± 20%

Wave shape of short circuit current (8/20 µs), wave shape definition according to IEC/EN 61000-4-5.

WARNING - Using improper equipment when measuring surge pulses can result in personal injury or equipment damage.

NOTE - Teseq recommends using a Teseq MD 200 or MD 200A differential probe in combination with a Teseq INA 6560 Fischer-to-banana adapter for surge pulse verification.



CW Parameter window

8.4.3 Voltage

Touch the "polarity" button (ALT in the example) to select test polarity. Polarity values are: **positive (POS), negative (NEG),** or **alternating (ALT).**

On odd pulse number there will be one pulse less in negative then in positive. Positive pulse will be first executed.

Touch the "voltage" button (200 V in the example) to enter the test voltage. A red frame is displayed around the field. The voltage value may be entered using the wheel or the keypad.

8.4.4 Impedance

Touch the "impedance" button (2 ohms in the example), it will repetitively change between 2 and 12 Ω.

8.4.5 Phase

Touch the “Synch/Asynch” button (Asynch in the example) to activate the synchronization of test pulses to the EUT mains frequency.

When this button is set to Asynch, the “phase value” button (--- in the example) will display ‘---’. When this button is set to Synch, the user must also set the phase value.

To set the phase value, touch the “phase value” button. A red frame is displayed around the field. The phase value may be entered using the wheel or the keypad.

The value is in degree units and may range from 0 to 359. Synch mode is only available if the EUT power is switched on.

8.4.6 Coupling

Touch the “coupling mode” button (ANSI COUPLING in the example) to select **SURGE OUTPUT, MANUAL CDN, ANSI COUPLING** or **IEC COUPLING.**

Surge output

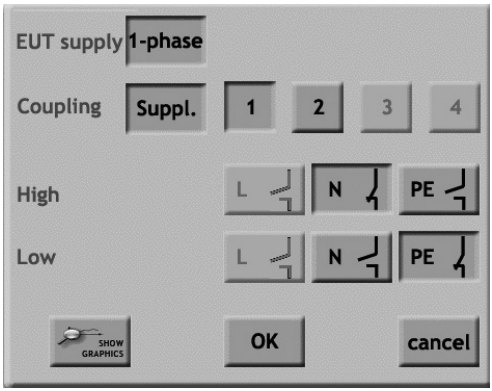
Select **SURGE OUTPUT** when a pulse is to be applied directly to the EUT; for example, in component testing of non-powered EUTs.

Manual CDN

This setting will compensate the loss of an external manual CDN such as the CDN 3083 or CDN 117. The internal impedance will be reduced by 0.37 Ω.

ANSI coupling

When **ANSI COUPLING** is selected the window. The appropriate coupling network (1- or 3-phase) is displayed automatically, depending on the type of CDN connected to the NSG 3060.



ANSI coupling selection window

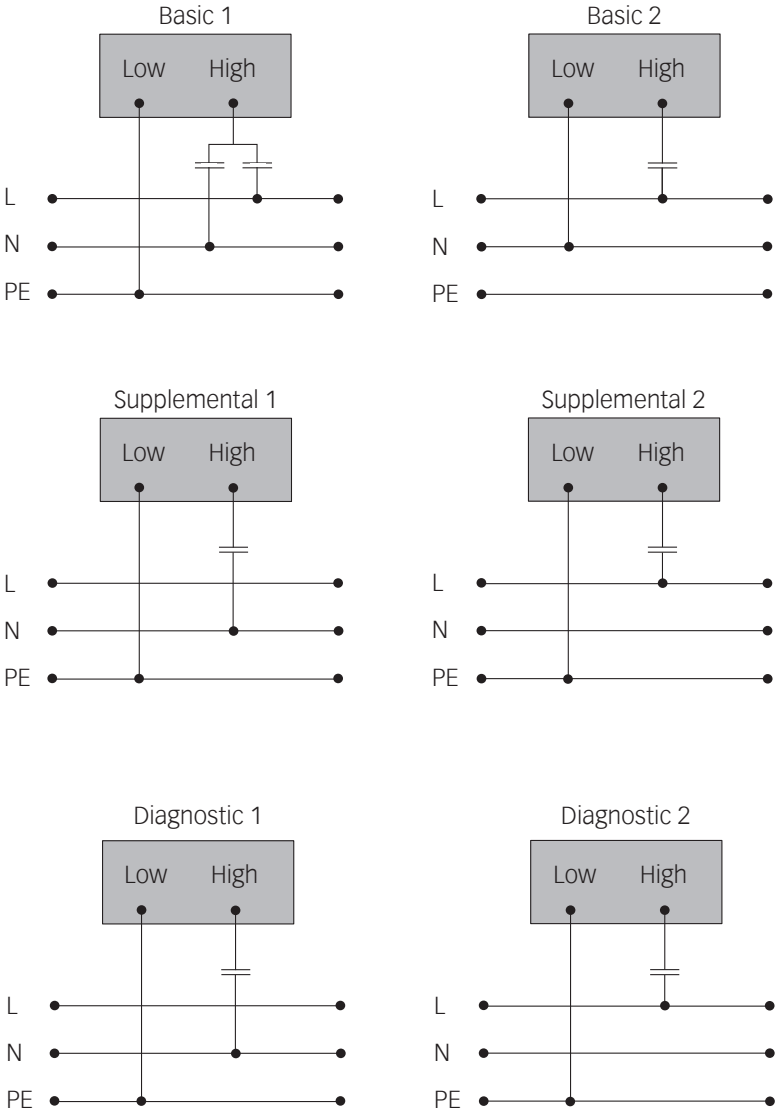
EUT supply

Touch the "EUT supply" button (1-phase in the example) to select a 1-, 2-, or 3-phase EUT supply mode.

NOTE - The EUT supply selection must match the EUT supply input on the rear panel of the CDN and the connections to the EUT from the front panel of the CDN. Otherwise, the coupling path setting will be switched incorrectly.

Coupling

Touch the coupling button (suppl. in the example) to select basic, supplemental, or diagnostic coupling mode. These modes are identical to those defined in the ANSI standard. Different coupling options are displayed depending on the EUT supply mode selected.



ANSI coupling modes for a 1-phase CDN

High/low

The coupling path will be shown by open or closed relay signs. The relay buttons ae not selectable, they are for information only.

By touching the "OK" button the selected coupling will be activated. With "cancel" it will close the window without saving the coupling selection. By touching the button "Show Graphics" it will illustate a graphical setting.

IEC coupling

When IEC coupling is selected the window in figure below displayed.

Touch the individual "High" and "Low output coupling" buttons (L, N, and PE in the example), to select an open or closed relay.

Touch "OK" to enable the coupling selection and close the window.

Touch "Cancel" to close the window without saving the coupling selection.

Touch "Show Graphics" to display a graphical example of the coupling selection.

IEC coupling selection window

8.4.7 Repetition time

Touch the "Repetition time" button (60 in the example) to set the test repetition time. A red frame is displayed around the field. The repetition time may be entered using the wheel or the keypad.

Touch the "units" button (s in the example) to set the time unit. Time units are **s** and **min.**

8.4.8 Test duration

Touch the "Test Duration" button (10 in the example) to set the test duration time. A red frame is displayed around the field. The duration time may be entered using the wheel or the keypad.

Touch the "units" button (pulse in the example) to set the unit. Unit values are pulse and cont (continuous).

8.4.9 Surge generator technical data

Parameter	Value
Pulse voltage (open circuit): Pulse current (short circuit):	± 200 V to 6.6 kV (in 1 V steps) ± 100 A to 3.3 kA
Impedance:	2 / 12 Ω
Polarity:	Positive / negative / alternate
Phase synchronization:	Asynchronous, synchronous 0° to 359° (in 1° steps)
Coupling:	ANSI / IEC / external / manual
Pulse repetition:	10* .... 600 s (in 1 sec steps) 1 .... 10 min.
Test duration:	1 to 9999 pulses Continuous

* Repetition rate depends on voltage:

200	to	4400 V	= 10 s repetition time
4401	to	6600 V	= 20 s repetition time

8.5 Ring wave (RW)

The ring wave is specified in the ANSI IEEE Std C62.41.2, 2002 and IEC/EN 61000-4-12.

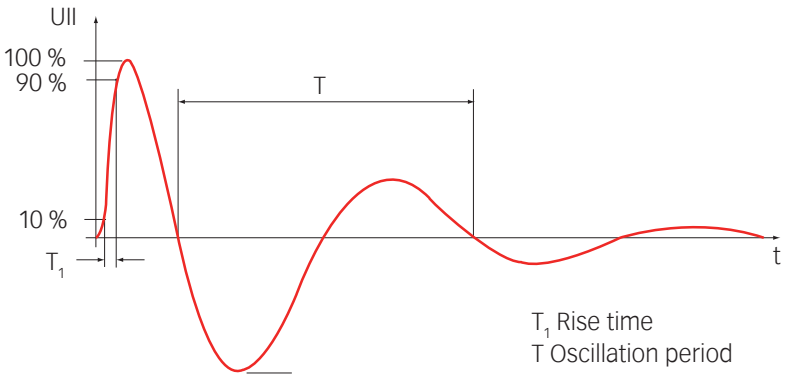
8.5.1 Test configuration for power line coupling

The test pulse is injected directly into the EUT power supply lines as they pass through the CDN of the test system. The EUT obtains its power from the EUT power outlet on the CDN of the test system where the voltage has the interference signal superimposed on it.

8.5.2 Test configuration with external coupling

Hereby the interference pulses are brought out to the Hi and Lo output sockets on the front panel to which an external coupler can be connected.

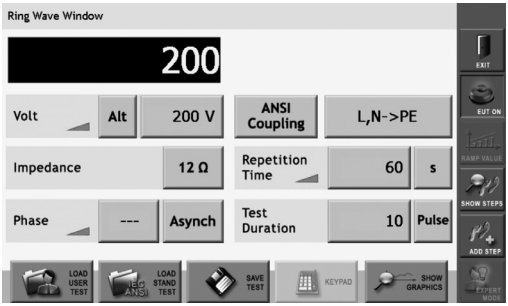
8.5.3 Ring wave parameters



The open-circuit voltage waveform is defined by the following parameters:

- Rise time: 0.5 µs
- Ringing frequency: 100 kHz

Note: No short-circuit current waveform is specified for the 100 kHz ring wave. Because the purpose of the ring wave is not to provide high-energy stress to the EUT, the precise specification of the current waveform is unnecessary.



Ring wave parameter window

8.5.4 Voltage

Touching the "Volt" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be changed either with the red wheel or using the keypad.
Touching the prefix repetitively it will change from **Alt**ernate to **Pos**itive and **Neg**ative.

On odd pulse number there will be one pulse less in negative then in positive. Positive pulse will be first executed.

8.5.5 Impedance

Touching the Impedance field, it will repetitively change between **12, 30 and 200 Ω.**

8.5.6 Phase

Touching the Phase field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be changed either with the red wheel or using the keypad. Touching the **Synch / Asynch** button it will change repetitively. In synch mode the **angle** can be changed either with the red wheel or using the keypad. Synch mode is only available if a CDN is connected and if the EUT power (AC) is switched on.

8.5.7 Coupling

Touching the coupling prefix repetitively it will change from **surge output, manual CDN, ANSI coupling** and **IEC coupling.**

Surge output

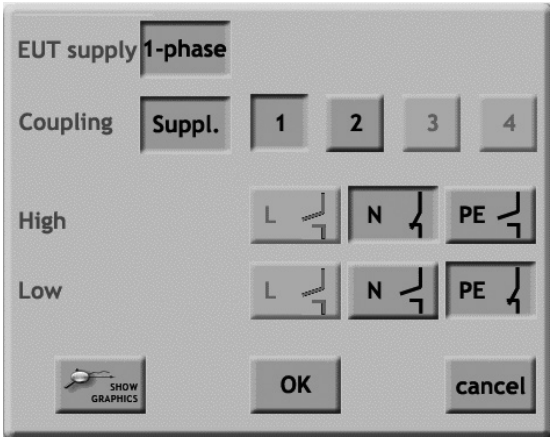
The surge output selection will activate the HV surge pulse output. This selection is used if pulse need to applied directly to an EUT like for testing of non-energized EUTs, socalled component testing.

Manual CDN

The factory settings for this selection is equal the surge output. But it is possible to compensate the loss of an external manual CDN's. To do so, the CDN hast to be sent with the unit to a Teseq facility for modification.

ANSI coupling

Touching the coupling line selection it will come up with a window. The appropriate coupling network (1-phase or 3-phase) is automatically given by the selected CDN. The 2-phase selection can be done only if a three phase coupler is connected. It is possible to use a three phase coupler also as a single phase CDN. Make sure, that the EUT connector on the CDN does match accordingly.



1-phase ANSI coupling possibilities

EUT supply
Set the EUT supply in mode: **1-phase, 2-phase** or **3-phase.**

Make sure, that the EUT connector on the CDN does match accordingly the EUT supply selection.

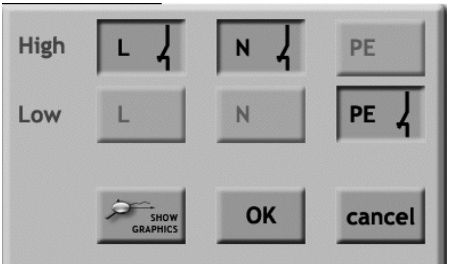
EUT supply selection has to be in line with the connected EUT supply input at the rear of the automated CDN otherwise the coupling path setting will be switched incorrect.

Coupling
The coupling mode can be set via multiple button touch between basic, supplemental and diagnostic. Those wording are equal to the ANSI standard. Depending on selected EUT supply mode different coupling mode level are selected. For the ANSI coupling path.

High/low
The coupling path will be shown by open or closed relay signs. The relay buttons are not selectable, they are for information only.

By touching the "OK" button the selected coupling will be activated. With "cancel" it will close the window without saving the coupling selection. By touching the button "Show Graphics" it will illustrate a graphical setting.

IEC coupling
IEC coupling is not recommended for ring wave, however it can be selected by touching the coupling line selection it will come up with a window. The desired line to ground or lines to ground can be set as well as line to line coupling. The coupling paths will be shown as open or closed relay signs. With touching the "OK" button the selected coupling will be taken. With "cancel" it will close the window without saving the coupling selection. With touching the button "Show Graphics" it will show a graphical setting.



8.5.8 Repetition time

Touching the "Repetition Time" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be changed either with the red wheel or using the keypad.
Touching the units repetitively will change from **s** to **min.**

8.5.9 Test duration

Touching the "Test Duration" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be changed either with the red wheel or using the keypad.
Touching the units repetitively it will change from **Pulse** to **Cont**inuous.

8.5.10 Technical data ring wave generator

Parameter	Value
Pulse voltage (open circuit):	± 200 V to 6.6 kV (in 1 V steps)
Pulse current (short circuit):	±16.6 to ±550 A, ± 10%, (12 Ω) ±6.6 to ±220 A, ± 10%, (30 Ω)
Impedance:	12 Ω / 30 Ω / 200 Ω
Polarity:	Positive / negative / alternate
Phase synchronization:	Asynchronous, synchronous 0° to 359° (in 1° steps)
Coupling:	ANSI / IEC / external / manual
Pulse repetition:	10* .... 600 s (in 1 s steps) 1 .... 10 min.
Test duration:	1 to 9999 pulses Continuous

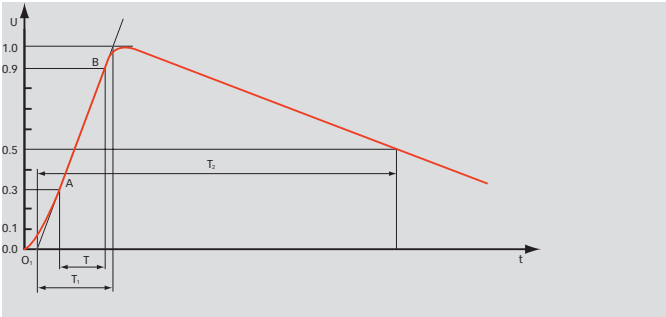
* Repetition rate depends on voltage:

200	to	4400 V	= 10 s repetition time
4401	to	6600 V	= 20 s repetition time

8.6 Telecom wave test

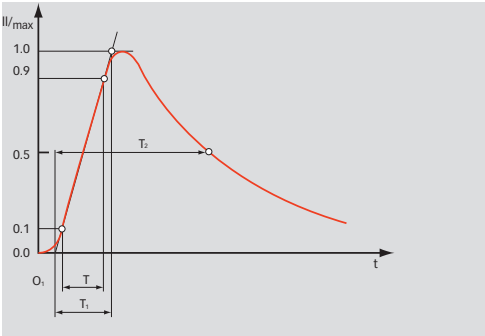
The telecom wave test, in compliance with IEC/EN 61000-4-5:2005 and IEC 60060-1, ITU–K series, ANSI/IEEE C62.41 and the safety standard of UL 1950 is used to test port of symmetrical driven communication lines.

The same purpose will cover the 9/720 µs pulse given in ANSI-TIA-968-B which is also part of the modules thanks to the tolerance of pulse given in the standard mentioned above it can be cover by 10/700 µs pulse.



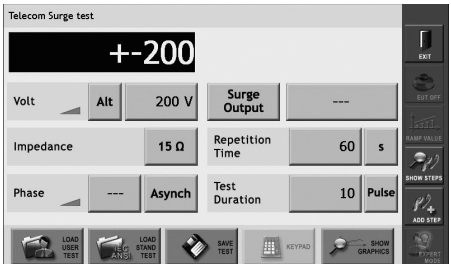
Front time T1 = 1.67 x T = 10 µs ± 30%
Time to half value T2 = 700 µs ± 20%

Waveform of open-circuit voltage (10/700 µs) (waveform defination according to IEC 80060-1).



Front time T1 = 1.25 x T = 5 µs ± 20%
Time to half value T2 = 320 µs ± 20%

WARNING - If a CDN is connected, the voltage can not be set higher than 6.6 kV this for safety reason to prevent damages to the CDN. To set the 7 kV range on the telecom pulse, the CDN system cable needs to be disconnected and the HV output of the Generator has to be disconnect from the CDN.



Telecom parameter window

8.6.1 Voltage

Touching the “Repetition Time” field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be changed either with the red wheel or using the keypad.

8.6.2 Impedance

Touch the “impedance” button (15 ohms in the example), it will repetitively change between 15 and 40 Ω.

8.6.3 Phase

Since telecom pulse always is injected asynchronous into telecommunication it may stay always to “Asynch”. But it is possible that in some rear cases a synchronisation to the power is needed for investigation purpose, so the phase angle can be set.

Touch the “Synch/Asynch” button (Asynch in the example) to activate the synchronization of test pulses to the EUT mains frequency.

When this button is set to Asynch, the “phase value” button (--- in the example) will display ‘---’. When this button is set to Synch, the user must also set the phase value.

To set the phase value, touch the “phase value” button. A red frame is displayed around the field. The phase value may be entered using the wheel or the keypad.

The value is in degree units and may range from 0 to 359. Synch mode is only available if the EUT power is switched on.

8.6.4 Coupling

Touch the “coupling mode” button **SURGE OUTPUT,** or **MANUAL CDN.**

Surge output

Select **SURGE OUTPUT** when a pulse is to be applied directly to the EUT; for example, in component testing of non-powered EUTs.

Manual CDN

This setting will compensate the loss of an external **MANUAL CDN** such as the CDN 3083 or CDN 117/118. The internal impedance will be reduced by 0.37 Ω.

8.6.5 Repetition time

Touch the “Repetition time” button (60 in the example) to set the test repetition time. A red frame is displayed around the field. The repetition time may be entered using the wheel or the keypad. Touch the “units” button (s in the example) to set the time unit. Time units are s and min. Touching the units repetitively will change from **s** to **min.**

8.6.6 Test duration

Touch the “Test Duration” button (10 in the example) to set the test duration time. A red frame is displayed around the field. The duration time may be entered using the wheel or the keypad.

Touch the “units” button (pulse in the example) to set the unit. Unit values are **PULSE** and **CONT** (continuous).

Parameter	Value
Pulse voltage (open circuit):	± 200 V to 7.7 kV (in 1 V steps)
Pulse current (short circuit):	± 13.3 A to 513.3 A
Impedance:	15 / 40 Ω
Polarity:	Positive / negative / alternate
Phase synchronization:	Asynchronous, (synchronous 0° to 359° in 1° steps)
Coupling:	external / manual
Pulse repetition:	20* to 30 s, up to 600 s (in 1 sec steps)
Test duration:	1 to 9999 pulses Continuous

* Repetition rate depends on voltage:

200	to	4400 V	= 20 s repetition time
4401	to	7700 V	= 30 s repetition time

8.7 Mains power quality (PQT)

The PQT test involves the emulation of mains voltage dips and brief interruptions as specified in the international standard EN/IEC 61000-4-11.

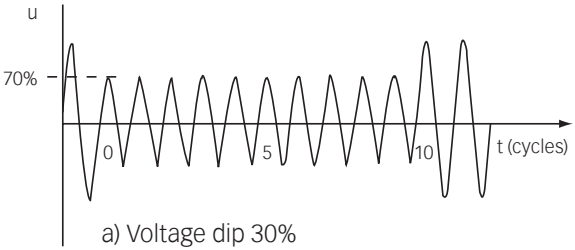
The generator causes disturbances on the EUT supply line that is brought out to the EUT power outlet socket of the 1-phase CDN. A dip have occurred when the nominal voltage falls by a significant amount during a certain number of cycles. The standard specifies dips of 20, 30 and 60% (i.e. the voltage falls to 80, 70 and 40% of the nominal level respectively).

An external variable transformer (variac), transformer with taps or a DC power source is to be fed into the appropriate pins of an extra input socket for freely selectable voltage dips.

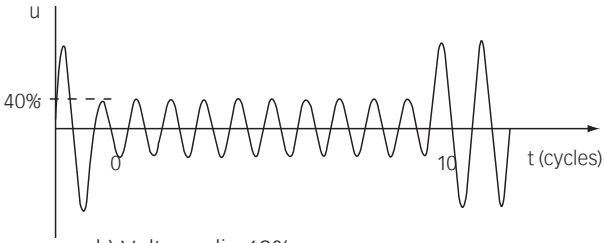
An interruption occurs when the supply voltage disappears completely for a certain number of cycles (or falls to a value less than 5% of its nominal voltage).

NOTE - Dips and interrupts appear on the phase (L) line only.

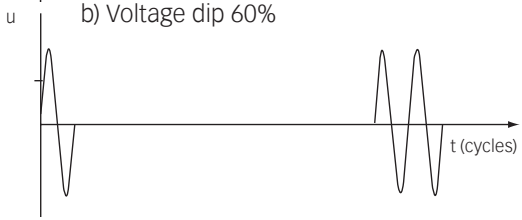
8.7.1 Sample graphs of dips/interrupts



a) Voltage dip 30%

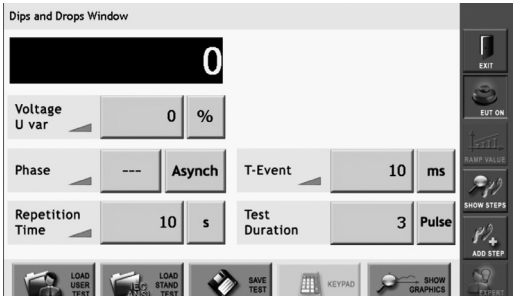


b) Voltage dip 60%



c) Voltage dip 100%

8.7.2 Mains power quality generator



PQT Parameter window

8.7.3 Voltage U Var

If no automatic variac or automatic transformer being connected, then the voltage dips or interrupts will always occur to 0%. Touching the units repetitively it will change from **%** to **Volts.**

If a manual voltage source being connected, then the dips/interrupts level will follow the manually set voltage at the EUT input.

8.7.4 Phase

Touching the "Phase" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be modified either with the red wheel or using the keypad. Touching the "**Synch/Asynch"** button it will change repetitively. In synch mode the **angle** can be modified either with the red wheel or using the keypad. Synch mode is only available along with a automated CDN and if the EUT power (AC) is switched on.

8.7.5 Repetition time

Touching the "Repetition Time" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be modified either with the red wheel or by using the keypad.
Touching the units repetitively will change from **s, min, cycle, µs** to **ms.**

8.7.6 T-Event

Touching the "T-Event" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be modified either with the red wheel or using the keypad.
Touching the units repetitively will change from **ms, s, cycle,** $^{1}/_{10}$ **cycle** or **µs.**

8.7.7 Test duration

Touching the "Test Duration" field, it will come up with a red frame to indicate the selected parameter being ready for change. The value can be modified either with the red wheel or using the keypad.
Touching the units repetitively will change from **Pulse, Cont**inuous, **s** to **min.**

8.7.8 Dips and interrupts characteristics

Parameter	Value
Dips & interrupts:	From EUT voltage input to 0 V; 0% (1)
Uvar with optional variac:	up to 265 V or up to 115% of Uin 16 A max. ±10%
Uvar step transformer:	0%; 40%; 70%; 80%
Peak inrush current capability:	>500 A (at 230 V)
Switching times:	1 to 5 µs (100 Ω load)
Phase synchronization:	Asynchronous, synchronous 0° to 359° (in 1° steps)
Repetition time:	µs: 40 ... 99'999 ms: 1 ... 99'999 s: 1 ... 1'999 min: 1 ... 35 cycle: 1 ... 99'999
Event time (T-Event):	µs: 20 ... 99'999 ms: 1 ... 99'999 s: 1 ... 1'999 cycle: 1 ... 300 $^1/_{10}$ cycle: 1 ... 3'000
Test duration:	s: 1 ... 99'999 min: 1 ... 70'000 pulse: 1 ... 99'999 Continuous

(1) Effective minimal dip voltage ~8 V. As specified in IEC 61000-4-11, chapt. 5.1 a test voltage level from 0% to 20% of the rated voltage is considered as a total interruption.

8.8. Variation test (-4-11) – automatic procedure

Parameter	Value
Uvar with optional variac:	up to 265 V (in 1 V steps) or up to 115% of Uin (in 1% steps)
Phase synchronization:	asynchronous, synchronous, 0° to 359° (in 1° steps)
Repetition time:	1000 ms to 35 min. 1 to 99'999 cycles

Decreasing time Td:	abrupt 1 ms to 5'000 ms 1 s to 5 s 1 to 250 cycles for 50 Hz 1 to 300 cycles for 60 Hz
Time at reduced voltage Ts:	10 ms to 10'000 ms 1 s to 10 s 1 to 250 cycles for 50 Hz 1 to 300 cycles for 60 Hz
Increasing time Ti:	10 ms to 5'000 ms 1 s to 5 s 1 to 250 cycles for 50 Hz 1 to 300 cycles for 60 Hz
Test duration:	1 s to 99'999 s 1 min. to 70'000 min. 1 to 99'999 pulse Continous

Automatic accessories for power quality test
All automated standard accessories for PQT test provides a convenient means of reducing the incoming supply voltage. It is required for power quality testing (PQT) and is fully compliant with the latest revision of IEC/EN 61000-4-11 (2004).

Once detected, the functions are available in the user interface software. Its fully automatic controlled, driven from NSG 3060.

With the step transformer INA 6502 the Uvar settings 0% – 40% – 70% – 80% will appear.

Connecting the single variac VAR 3005-S16 or VAR 6501 the settings of Uvar will be possible in volts or % of Uin. Therefore Uin needs to be set first in the "General" settings menu. Uin in this case is the actual input voltage of the single variac.

Connecting the double variac VAR 3005-D16 or VAR 6502 it is important that Uin in the "General" setting needs to be set first before entering the variation screen. The value of Uin is variable with the double variac.

NSG 3060 EMC test system

For proper operation of the plug and play detection mechanisms it is strongly recommended to power on first the accessory and then the NSG 3060 main frame.

Powering on the NSG 3060 main frame before the accessories may result in non-detection of accessories.

8.9 Power magnetic field testing (-4-8) – automatic procedure

Parameter	Value
AC field:	1 to 40 A/m (in 1 A/m steps)
Frequency:	50 Hz / 60 Hz
Coil factor:	0.01 to 99.99
Test duration:	1 to 9'999 pulses; continuous

8.10 Pulsed magnetic field testing (-4-9)

Tests with pulsed magnetic fields simulate the type of field produced by surge pulses such as those occurring during lightning strokes on buildings and other metallic structures such as free-standing masts, lightning conductors, earth networks, etc.

The NSG 3060 in conjunction with the **pulse wave shape adaptor** and a **loop antenna** it generates these fields in accordance with the IEC 61000-4-9 standard by inducing a surge current into magnetic field loop.

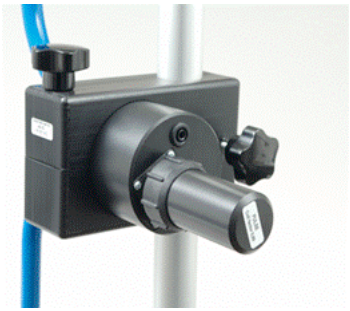
It is recommended for the user to stay away (at least a few meters) from the loop antenna while magnetic fields are generated. Also keep away magnetic field sensitive devices and items such as credit cards – magnetic key cards etc... which might be influenced by the field.

8.10.1 The optional magnetic field loops INA 701 and INA 702

Tests with mains frequency according IEC/EN 61000-4-8, in conjunction with the MFO 6501/6502 option, and pulsed magnetic fields are performed using the magnetic field loops designed for NSG 3060.

These are rectangular loops measuring 1 x 1m and are suitable for test objects with dimensions up to 0.6 x 0.6 x 0.5m (l x w x h). For the pulsed magnetic field test two types of loop can be supplied:

The INA 701 is a coil with a factor of 0.89. It enables field strengths up to 3.6A/m for mains frequency fields 50 or 60Hz when used with the MFO 6501 or MFO 6502 current sources option and 1200A/m for pulsed magnetic fields.



The INA 702 is a 1 x 1m loop - 11 turns – coil factor 9.8 - when fitted with the power plug. It enables the generation of field strengths of up to 40A/m for mains frequency fields 50 or 60Hz when used with the MFO 6501 or MFO 6502 current sources option.

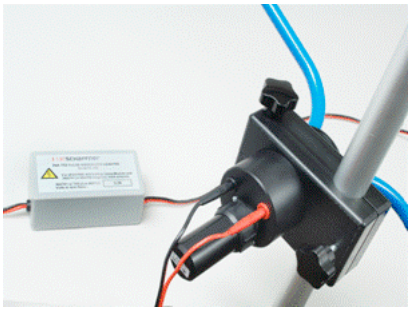
The INA 702 becomes a single turn loop when fitted with the pulse plug, which allows the generation of pulsed field strengths up to 1200A/m, where the current is generated by surge generator.

8.10.2 Pulse wave shape adapter INA 753

In order to meet the pulse waveform required by IEC 61000-4-9, the wave shape adapter INA 753 needs to be used with NSG 3060 and the INA 701 or 702 loop antennas.

The pulse wave shape adapter INA 753 is a standard accessory for the NSG 3060. It provides a convenient means for interconnecting the surge generator output with the loop antennas INA 701 or 702 and insures that the generated pulsed magnetic field has the wave shape as specified in the application standard.

The control is fully automatic, driven from the NSG. The user will setup his tests directly in A/m, the internal software makes the calculation and drives the combination wave pulse moduel to generate the right current.



Two safety banana plugs provide a convenient means to connect the loop antenna; two Fischer HV plugs allow connection to Surge Hi and Lo outputs of NSG 3060.

The field generated in the loop antenna is directly proportional to the current flowing through it:

Field strength (A/m) H = Cf x I

Where H is the generated field Cf the coil factor and I the current generated by the combination wave pulse module.

8.10.3 Generator setting

Generally surge generators get set by voltage, the current they deliver will depend on the load impedance. In this case the load consists of the loop antenna plus the wave shape adapter which is fix and stable. So there is a direct relationship between the generator voltage setting and the current delivered to the load.

As the current in the loop antenna and the generated field (coil factor) are proportional, there will be a direct relationship between the surge generator's voltage setting and the generated field.

In case an INA 702 loop antenna is used, the termination plug labelled "Pulse" needs to be used.

8.10.4 Technical data pulsed magnetic field test

Parameter	Value
Pulsed field:	1 to 1200 A/m (in 1 A/m steps), higher possible with lower coil factor
Polarity:	positive / negative / alternate
Repetition time:	10 s to 10 min. (in 1 s steps)
Impedance:	2 Ω
Coil factor:	0.35 to 99.99 in 0.01 step
Test duration:	1 to 9'999 pulses Continuous
Phase synchronization:	Asynchronous, synchronous 0 to 359° (in 1° steps)

8.11 Power magnetic field test (-4-8) - automatic procedure

Mains frequency magnetic fields simulate the kind of stray fields that occur around current carrying power supply lines.

The optional MFO can be connected to the NSG 3060 using the convenient user interface for easy test setting.

The automated MFO together with the INA 701 or 702 loop antenna generates test conditions in accordance with the IEC 61000-4-8 standard by inducing a strong current into a magnetic field loop.

8.11.1 Automatic magnetic field option MFO 6502

The automatic current generator type MFO 6502 (magnetic field option) is a standard accessory for the Teseq NSG 30xx series

It is required for magnetic field testing for fields up to 40 A/m.

MFO 6502 is designed to drive INDUCTIVE LOADS ONLY, as magnetic field loops. Connecting capacitive loads will destroy the Instrument

For more information refer to the MFO manual.

8.11.2 Technical data power magnetic field test

Parameter	Value
Field strength:	1 to 99999 mA/m (in 1 mA/m steps) 1 to 100 A/m (in 1 A/m steps)
Frequency:	50 Hz / 60 Hz
Coil factor:	0.01 to 99.99 (in 0.01 steps)
Test duration:	1 to 9’999 s 1 to 166 min Continuous

8.12 Standard test parameter

Basic Standard, IEC 61000-4-4 2004_Ed_2									
File name implemented	Test step	Voltage	Polarity	Frequency	Phase	Coupling	Burst time	Rep. time	Test duration
ANSI-IEC 1PH POWER LINES LEVEL 1	1/2	500 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	500 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 1PH POWER LINES LEVEL 2	1/2	1000 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	1000 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 1PH POWER LINES LEVEL 3	1/2	2000 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	2000 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 1PH POWER LINES LEVEL 4	1/2	4000 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	4000 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 1	1/2	500 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	500 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 2	1/2	1000 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	1000 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 3	1/2	2000 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	2000 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 4	1/2	4000 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	4000 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 1	1/2	250 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	250 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 2	1/2	500 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	500 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 3	1/2	1000 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	1000 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 4	1/2	2000 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	2000 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s

Basic Standard, IEC 61000-4-4 2004_Ed_2									
File name implemented	**Test step**	**Voltage**	**Polarity**	**Frequency**	**Phase**	**Coupling**	**Burst time**	**Rep. time**	**Test duration**
ANSI-IEC 1PH POWER LINES LEVEL 1	1/2	500 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	500 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 1PH POWER LINES LEVEL 2	1/2	1000 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	1000 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 1PH POWER LINES LEVEL 3	1/2	2000 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	2000 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 1PH POWER LINES LEVEL 4	1/2	4000 V	±	5 kHz	Asynch	L, N, PE	15 ms	300 ms	120 s
	2/2	4000 V	±	100 kHz	Asynch	L, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 1	1/2	500 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	500 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 2	1/2	1000 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	1000 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 3	1/2	2000 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	2000 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC 3PH POWER LINES LEVEL 4	1/2	4000 V	±	5 kHz	Asynch	L1, L2, L3, N, PE	15 ms	300 ms	120 s
	2/2	4000 V	±	100 kHz	Asynch	L1, L2, L3, N, PE	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 1	1/2	250 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	250 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 2	1/2	500 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	500 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 3	1/2	1000 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	1000 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s
ANSI-IEC CAP.COUPL. LEVEL 4	1/2	2000 V	±	5 kHz	Asynch	Burst output	15 ms	300 ms	120 s
	2/2	2000 V	±	100 kHz	Asynch	Burst output	750us	300 ms	120 s

Basic Standard, IEC 61000-4-5								
File name implemented	Test step	Voltage	Polarity	Impedance	Phase	Coupling	Rep. time	Test duration
IEC 1PH POWER LINES L-N LEVEL 1	1/1	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-N LEVEL 2	1/2	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	2/2	1000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-N LEVEL 3	1/3	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	2/3	1000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	3/3	2000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-N LEVEL 4	1/4	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	2/4	1000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	3/4	2000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	4/4	4000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 1	1/1	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 2	1/2	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/2	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 3	1/3	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/3	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/3	2000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 4	1/4	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 1	1/1	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 2	1/2	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/2	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 3	1/3	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/3	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/3	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 4	1/4	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse

Basic Standard, IEC 61000-4-5								
File name implemented	Test step	Voltage	Polarity	Impedance	Phase	Coupling	Rep. time	Test duration
IEC 1PH POWER LINES L-N LEVEL 1	1/1	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-N LEVEL 2	1/2	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	2/2	1000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-N LEVEL 3	1/3	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	2/3	1000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	3/3	2000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-N LEVEL 4	1/4	500 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	2/4	1000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	3/4	2000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
	4/4	4000 V	±	2	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 1	1/1	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 2	1/2	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/2	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 3	1/3	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/3	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/3	2000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES L-PE LEVEL 4	1/4	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 1	1/1	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 2	1/2	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/2	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 3	1/3	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/3	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/3	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1PH POWER LINES N-PE LEVEL 4	1/4	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse

IEC 3PH POWER LINES LX-LX LEVEL 1	1/6	500 V	±	2	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	500 V	±	2	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	500 V	±	2	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	500 V	±	2	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	500 V	±	2	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	500 V	±	2	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3PH POWER LINES LX-LX LEVEL 2	1/6	1000 V	±	2	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	1000 V	±	2	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	1000 V	±	2	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	1000 V	±	2	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	1000 V	±	2	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	1000 V	±	2	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3PH POWER LINES LX-LX LEVEL 3	1/6	2000 V	±	2	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	2000 V	±	2	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	2000 V	±	2	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	2000 V	±	2	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	2000 V	±	2	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	2000 V	±	2	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3PH POWER LINES LX-LX LEVEL 4	1/6	4000 V	±	2	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	4000 V	±	2	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	4000 V	±	2	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	4000 V	±	2	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	4000 V	±	2	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	4000 V	±	2	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3PH POWER LINES LX-PE LEVEL 1	1/4	500 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	500 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	500 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3PH POWER LINES LX-PE LEVEL 2	1/4	1000 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	1000 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3PH POWER LINES LX-PE LEVEL 3	1/4	2000 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	2000 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3PH POWER LINES LX-PE LEVEL 4	1/4	4000 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	4000 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	4000 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC DC LINES L-N LEVEL 1	1/1	500 V	±	2	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N LEVEL 2	1/2	500 V	±	2	Asynch	L1 -> N	60 s	10 pulse
	2/2	1000 V	±	2	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N LEVEL 3	1/3	500 V	±	2	Asynch	L1 -> N	60 s	10 pulse
	2/3	1000 V	±	2	Asynch	L1 -> N	60 s	10 pulse
	3/3	2000 V	±	2	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N LEVEL 4	1/4	500 V	±	2	Asynch	L1 -> N	60 s	10 pulse
	2/4	1000 V	±	2	Asynch	L1 -> N	60 s	10 pulse
	3/4	2000 V	±	2	Asynch	L1 -> N	60 s	10 pulse
	4/4	4000 V	±	2	Asynch	L1 -> N	60 s	10 pulse

IEC UNSH. UNSYMM. I-O LINES LEVEL 1	1/1	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 2	1/2	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
	2/2	1000 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 3	1/3	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
	2/3	1000 V	±	2	Asynch	Surge Output	60 s	10 pulse
	3/3	2000 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 4	1/4	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
	2/4	1000 V	±	2	Asynch	Surge Output	60 s	10 pulse
	3/4	2000 V	±	2	Asynch	Surge Output	60 s	10 pulse
	4/4	4000 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 1	1/1	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 2	1/2	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
	2/2	1000 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 3	1/3	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
	2/3	1000 V	±	2	Asynch	Surge Output	60 s	10 pulse
	3/3	2000 V	±	2	Asynch	Surge Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 4	1/4	500 V	±	2	Asynch	Surge Output	60 s	10 pulse
	2/4	1000 V	±	2	Asynch	Surge Output	60 s	10 pulse
	3/4	2000 V	±	2	Asynch	Surge Output	60 s	10 pulse
	4/4	4000 V	±	2	Asynch	Surge Output	60 s	10 pulse

Basic Standard, IEC 61000-4-5 2005_Ed_2								
File name implemented	Test step	Voltage	Polarity	Impedance	Phase	Coupling	Rep. time	Test duration
SYMM. OPERATED ALL LINES TO PE LEVEL 1	1/1	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
SYMM. OPERATED ALL LINES TO PE LEVEL 2	1/2	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
	2/2	1000 V	±	15	Asynch	Surge Output	60 s	10 pulse
SYMM. OPERATED ALL LINES TO PE LEVEL 3	1/3	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
	2/3	1000 V	±	15	Asynch	Surge Output	60 s	10 pulse
	3/3	2000 V	±	15	Asynch	Surge Output	60 s	10 pulse
SYMM. OPERATED ALL LINES TO PE LEVEL 4	1/4	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
	2/4	1000 V	±	15	Asynch	Surge Output	60 s	10 pulse
	3/4	2000 V	±	15	Asynch	Surge Output	60 s	10 pulse
	4/4	4000 V	±	15	Asynch	Surge Output	60 s	10 pulse
SHIELDED IO COMM LINES LEVEL 1	1/1	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
SHIELDED IO COMM LINES LEVEL 2	1/2	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
	2/2	1000 V	±	15	Asynch	Surge Output	60 s	10 pulse
SHIELDED IO COMM LINES LEVEL 3	1/3	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
	2/3	1000 V	±	15	Asynch	Surge Output	60 s	10 pulse
	3/3	2000 V	±	15	Asynch	Surge Output	60 s	10 pulse
SHIELDED IO COMM LINES LEVEL 4	1/4	500 V	±	15	Asynch	Surge Output	60 s	10 pulse
	2/4	1000 V	±	15	Asynch	Surge Output	60 s	10 pulse
	3/4	2000 V	±	15	Asynch	Surge Output	60 s	10 pulse
	4/4	4000 V	±	15	Asynch	Surge Output	60 s	10 pulse

Basic Standard, IEC 61000-4-12 2006_Ed_2								
File name implemented	Test step	Voltage	Polarity	Impedance	Phase	Coupling	Rep. time	Test duration
IEC 1-PH M. FEEDER LINE L-N LEVEL 1	1/1	250 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-N LEVEL 2	1/2	250 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
	2/2	500 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-N LEVEL 3	1/3	250 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
	2/3	500 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
	3/3	1000 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-N LEVEL 4	1/4	250 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
	2/4	500 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
	3/4	1000 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
	4/4	2000 V	±	12	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH POWER LINE L-N LEVEL 1	1/1	250 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH POWER LINE L-N LEVEL 2	1/2	250 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
	2/2	500 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH POWER LINE L-N LEVEL 3	1/3	250 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
	2/3	500 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
	3/3	1000 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH POWER LINE L-N LEVEL 4	1/4	250 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
	2/4	500 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
	3/4	1000 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
	4/4	2000 V	±	30	0°- 270°/90°	L -> N	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-PE LEVEL 1	1/1	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-PE LEVEL 2	1/2	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/2	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-PE LEVEL 3	1/3	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/3	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/3	2000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE L-PE LEVEL 4	1/4	500 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	L -> PE	60 s	10 pulse

IEC 1-PH POWER LINE L-PE LEVEL 1	1/1	500 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH POWER LINE L-PE LEVEL 2	1/2	500 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/2	1000 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH POWER LINE L-PE LEVEL 3	1/3	500 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/3	1000 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/3	2000 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH POWER LINE L-PE LEVEL 4	1/4	500 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
	2/4	1000 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
	3/4	2000 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
	4/4	4000 V	±	30 ohm	0°- 270°/90°	L -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE N-PE LEVEL 1	1/1	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE N-PE LEVEL 2	1/2	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/2	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE N-PE LEVEL 3	1/3	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/3	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/3	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH M. FEEDER LINE N-PE LEVEL 4	1/4	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH POWER LINE N-PE LEVEL 1	1/1	500 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH POWER LINE N-PE LEVEL 2	1/2	500 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/2	1000 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH POWER LINE N-PE LEVEL 3	1/3	500 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/3	1000 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/3	2000 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 1-PH POWER LINE N-PE LEVEL 4	1/4	500 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
	2/4	1000 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
	3/4	2000 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
	4/4	4000 V	±	30 ohm	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-LX LEVEL 1	1/6	250 V	±	12	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	250 V	±	12	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	250 V	±	12	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	250 V	±	12	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	250 V	±	12	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	250 V	±	12	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-LX LEVEL 2	1/6	500 V	±	12	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	500 V	±	12	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	500 V	±	12	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	500 V	±	12	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	500 V	±	12	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	500 V	±	12	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-LX LEVEL 3	1/6	1000 V	±	12	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	1000 V	±	12	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	1000 V	±	12	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	1000 V	±	12	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	1000 V	±	12	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	1000 V	±	12	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-LX LEVEL 4	1/6	2000 V	±	12	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	2000 V	±	12	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	2000 V	±	12	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	2000 V	±	12	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	2000 V	±	12	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	2000 V	±	12	0°- 270°/90°	L2 -> L3	60 s	10 pulse

IEC 3-PH POWER LINE LX-LX LEVEL 1	1/6	250 V	±	30	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	250 V	±	30	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	250 V	±	30	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	250 V	±	30	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	250 V	±	30	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	250 V	±	30	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH POWER LINE LX-LX LEVEL 2	1/6	500 V	±	30	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	500 V	±	30	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	500 V	±	30	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	500 V	±	30	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	500 V	±	30	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	500 V	±	30	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH POWER LINE LX-LX LEVEL 3	1/6	1000 V	±	30	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	1000 V	±	30	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	1000 V	±	30	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	1000 V	±	30	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	1000 V	±	30	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	1000 V	±	30	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH POWER LINE LX-LX LEVEL 4	1/6	2000 V	±	30	0°- 270°/90°	L1 -> N	60 s	10 pulse
	2/6	2000 V	±	30	0°- 270°/90°	L2 -> N	60 s	10 pulse
	3/6	2000 V	±	30	0°- 270°/90°	L3 -> N	60 s	10 pulse
	4/6	2000 V	±	30	0°- 270°/90°	L1 -> L2	60 s	10 pulse
	5/6	2000 V	±	30	0°- 270°/90°	L1 -> L3	60 s	10 pulse
	6/6	2000 V	±	30	0°- 270°/90°	L2 -> L3	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-PE LEVEL 1	1/4	500 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	500 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	500 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	500 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-PE LEVEL 2	1/4	1000 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	1000 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	1000 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	1000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-PE LEVEL 3	1/4	2000 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	2000 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	2000 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	2000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH M. FEEDER LINE LX-PE LEVEL 4	1/4	4000 V	±	12	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	4000 V	±	12	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	4000 V	±	12	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	4000 V	±	12	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH POWER LINE LX-PE LEVEL 1	1/4	500 V	±	30	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	500 V	±	30	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	500 V	±	30	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	500 V	±	30	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH POWER LINE LX-PE LEVEL 2	1/4	1000 V	±	30	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	1000 V	±	30	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	1000 V	±	30	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	1000 V	±	30	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH POWER LINE LX-PE LEVEL 3	1/4	2000 V	±	30	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	2000 V	±	30	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	2000 V	±	30	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	2000 V	±	30	0°- 270°/90°	N -> PE	60 s	10 pulse
IEC 3-PH POWER LINE LX-PE LEVEL 4	1/4	4000 V	±	30	0°- 270°/90°	L1 -> PE	60 s	10 pulse
	2/4	4000 V	±	30	0°- 270°/90°	L2 -> PE	60 s	10 pulse
	3/4	4000 V	±	30	0°- 270°/90°	L3 -> PE	60 s	10 pulse
	4/4	4000 V	±	30	0°- 270°/90°	N -> PE	60 s	10 pulse

IEC DC LINES L-N 12 R LEVEL 1	1/1	500 V	±	12	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 12 R LEVEL 2	1/2	500 V	±	12	Asynch	L1 -> N	60 s	10 pulse
	2/2	1000 V	±	12	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 12 R LEVEL 3	1/3	500 V	±	12	Asynch	L1 -> N	60 s	10 pulse
	2/3	1000 V	±	12	Asynch	L1 -> N	60 s	10 pulse
	3/3	2000 V	±	12	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 12 R LEVEL 4	1/4	500 V	±	12	Asynch	L1 -> N	60 s	10 pulse
	2/4	1000 V	±	12	Asynch	L1 -> N	60 s	10 pulse
	3/4	2000 V	±	12	Asynch	L1 -> N	60 s	10 pulse
	4/4	4000 V	±	12	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 30 R LEVEL 1	1/1	500 V	±	30	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 30 R LEVEL 1	1/2	500 V	±	30	Asynch	L1 -> N	60 s	10 pulse
	2/2	1000 V	±	30	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 30 R LEVEL 1	1/3	500 V	±	30	Asynch	L1 -> N	60 s	10 pulse
	2/3	1000 V	±	30	Asynch	L1 -> N	60 s	10 pulse
	3/3	2000 V	±	30	Asynch	L1 -> N	60 s	10 pulse
IEC DC LINES L-N 30 R LEVEL 1	1/4	500 V	±	30	Asynch	L1 -> N	60 s	10 pulse
	2/4	1000 V	±	30	Asynch	L1 -> N	60 s	10 pulse
	3/4	2000 V	±	30	Asynch	L1 -> N	60 s	10 pulse
	4/4	4000 V	±	30	Asynch	L1 -> N	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 1	1/1	500 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 2	1/2	500 V	±	12	Asynch	Output	60 s	10 pulse
	2/2	1000 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 3	1/3	500 V	±	12	Asynch	Output	60 s	10 pulse
	2/3	1000 V	±	12	Asynch	Output	60 s	10 pulse
	3/3	2000 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. UNSYMM. I-O LINES LEVEL 4	1/4	500 V	±	12	Asynch	Output	60 s	10 pulse
	2/4	1000 V	±	12	Asynch	Output	60 s	10 pulse
	3/4	2000 V	±	12	Asynch	Output	60 s	10 pulse
	4/4	4000 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 1	1/1	500 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 2	1/2	500 V	±	12	Asynch	Output	60 s	10 pulse
	2/2	1000 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 3	1/3	500 V	±	12	Asynch	Output	60 s	10 pulse
	2/3	1000 V	±	12	Asynch	Output	60 s	10 pulse
	3/3	2000 V	±	12	Asynch	Output	60 s	10 pulse
IEC UNSH. SYMM. COMM. LINES LEVEL 4	1/4	500 V	±	12	Asynch	Output	60 s	10 pulse
	2/4	1000 V	±	12	Asynch	Output	60 s	10 pulse
	3/4	2000 V	±	12	Asynch	Output	60 s	10 pulse
	4/4	4000 V	±	12	Asynch	Output	60 s	10 pulse

Basic Standard, IEC 61000-4-8 2001_Ed_1.1					
File name implemented	Test step	Field	Frequency	Test duration	Coil Factor
IEC 50HZ CF 9.8 LEVEL 1		1 A/m	50 Hz	60 s	9.8
IEC 60HZ CF 9.8 LEVEL 1		1 A/m	60 Hz	60 s	9.8
IEC 50HZ CF 9.8 LEVEL 2		3 A/m	50 Hz	60 s	9.8
IEC 60HZ CF 9.8 LEVEL 2		3 A/m	60 Hz	60 s	9.8
IEC 50HZ CF 9.8 LEVEL 3		10 A/m	50 Hz	60 s	9.8
IEC 60HZ CF 9.8 LEVEL 3		10 A/m	60 Hz	60 s	9.8
IEC 50HZ CF 9.8 LEVEL 4		30 A/m	50 Hz	60 s	9.8
IEC 60HZ CF 9.8 LEVEL 4		30 A/m	60 Hz	60 s	9.8

Basic Standard, IEC 61000-4-9 2001_Ed_1.1						
File name implemented	Test step	Field	Polarity	Rep. Time	Pulses	V to A/m Ratio
IEC LEVEL 3	1/2	100 A/m	+/-	10 s	10	0.98
IEC LEVEL 4	1/2	300 A/m	+/-	20 s	10	0.98
IEC LEVEL 5	1/2	1000 A/m	+/-	20 s	10	0.98

Basic Standard, IEC 61000-4-11 2002_Ed_2				
File name implemented	Phase	Rep. time	T-Event (ts)	Test duration
IEC 50HZ CLASS 2 DIPS 0PC 0.5 CYCLE	0°-315°/45°	10 s	10 ms	3 pulses
IEC 60HZ CLASS 2 DIPS 0PC 0.5 CYCLE	0°-315°/45°	10 s	8333 us	3 pulses
IEC 50HZ CLASS 2 DIPS 0PC 1 CYCLE	0°-315°/45°	10 s	1 cycle	3 pulses
IEC 60HZ CLASS 2 DIPS 0PC 1 CYCLE	0°-315°/45°	10 s	1 cycle	3 pulses
IEC 50HZ CLASS 2 DIPS 70PC 25 CYCLE	0°-315°/45°	10 s	25 cycle	3 pulses
IEC 60HZ CLASS 2 DIPS 70PC 30 CYCLE	0°-315°/45°	10 s	30 cycle	3 pulses
IEC 50HZ CLASS 3 DIPS 0PC 0.5 CYCLE	0°-315°/45°	10 s	10 ms	3 pulses
IEC 60HZ CLASS 3 DIPS 0PC 0.5 CYCLE	0°-315°/45°	10 s	8333 us	3 pulses
IEC 50HZ CLASS 3 DIPS 0PC 1 CYCLE	0°-315°/45°	10 s	1 cycle	3 pulses
IEC 60HZ CLASS 3 DIPS 0PC 1 CYCLE	0°-315°/45°	10 s	1 cycle	3 pulses
IEC 50HZ CLASS 3 DIPS 40PC 10 CYCLE	0°-315°/45°	10 s	10 cycle	3 pulses
IEC 60HZ CLASS 3 DIPS 40PC 12 CYCLE	0°-315°/45°	10 s	12 cycle	3 pulses
IEC 50HZ CLASS 3 DIPS 70PC 25 CYCLE	0°-315°/45°	10 s	25 cycle	3 pulses
IEC 60HZ CLASS 3 DIPS 70PC 30 CYCLE	0°-315°/45°	10 s	30 cycle	3 pulses
IEC 50HZ CLASS 3 DIPS 80PC 250 CYCLE	0°-315°/45°	10 s	250 cycle	3 pulses
IEC 60HZ CLASS 3 DIPS 80PC 300 CYCLE	0°-315°/45°	10 s	300 cycle	3 pulses
IEC 50HZ CLASS 2 S.INT. 0PC 250CYCLE	0°	10 s	250 cycle	3 pulses
IEC 60HZ CLASS 2 S.INT. 0PC 300CYCLE	0°	10 s	300 cycle	3 pulses
IEC 50HZ CLASS 3 S.INT. 0PC 250CYCLE	0°	10 s	250 cycle	3 pulses
IEC 60HZ CLASS 3 S.INT. 0PC 300CYCLE	0°	10 s	300 cycle	3 pulses
	Uvar			
File name implemented				
IEC DCV DIPS 10MS (40PC)	40%	10 s	0.01 s	3 pulses
IEC DCV DIPS 30MS (40PC)	40%	10 s	0.03 s	3 pulses
IEC DCV DIPS 100MS (40PC)	40%	10 s	0.1 s	3 pulses
IEC DCV DIPS 300MS (40PC)	40%	10 s	0.3 s	3 pulses
IEC DCV DIPS 1S (40PC)	40%	10 s	1 s	3 pulses
IEC DCV DIPS 10MS (70PC)	70%	10 s	0.01 s	3 pulses
IEC DCV DIPS 30MS (70PC)	70%	10 s	0.03 s	3 pulses
IEC DCV DIPS 100MS (70PC)	70%	10 s	0.1 s	3 pulses
IEC DCV DIPS 300MS (70PC)	70%	10 s	0.3 s	3 pulses
IEC DCV DIPS 1S (70PC)	70%	10 s	1 s	3 pulses
IEC DCV INTERRUPTION 1MS (0PC)	0	10 s	0.001 s	3 pulses
IEC DCV INTERRUPTION 3MS (0PC)	0	10 s	0.003 s	3 pulses
IEC DCV INTERRUPTION 10MS (0PC)	0	10 s	0.01 s	3 pulses
IEC DCV INTERRUPTION 30MS (0PC)	0	10 s	0.03 s	3 pulses
IEC DCV INTERRUPTION 100MS (0PC)	0	10 s	0.1 s	3 pulses
IEC DCV INTERRUPTION 300MS (0PC)	0	10 s	0.3 s	3 pulses
IEC DCV INTERRUPTION 1S (0PC)	0	10 s	1 s	3 pulses
IEC DCV VARIATION 100MS (85PC)	85%	10 s	0.1 s	3 pulses
IEC DCV VARIATION 300MS (85PC)	85%	10 s	0.3 s	3 pulses
IEC DCV VARIATION 1S (85PC)	85%	10 s	1 s	3 pulses
IEC DCV VARIATION 3S (85PC)	85%	10 s	3 s	3 pulses
IEC DCV VARIATION 10S (85PC)	85%	10 s	10 s	3 pulses
IEC DCV VARIATION 100MS (120PC)	120%	10 s	0.1 s	3 pulses
IEC DCV VARIATION 300MS (120PC)	120%	10 s	0.3 s	3 pulses
IEC DCV VARIATION 1S (120PC)	120%	10 s	1 s	3 pulses
IEC DCV VARIATION 3S (120PC)	120%	10 s	3 s	3 pulses
IEC DCV VARIATION 10S (120PC)	120%	10 s	10 s	3 pulses
IEC DCV VARIATION 100MS (80PC)	80%	10 s	0.1 s	3 pulses
IEC DCV VARIATION 300MS (80PC)	80%	10 s	0.3 s	3 pulses
IEC DCV VARIATION 1S (80PC)	80%	10 s	1 s	3 pulses
IEC DCV VARIATION 3S (80PC)	80%	10 s	3 s	3 pulses
IEC DCV VARIATION 10S (80PC)	80%	10 s	10 s	3 pulses

Basic Standard, IEC 61000-4-11 2002_Ed_2							
File name implemented	Uvar	Phase	Rep. time	T-Event (ts)	T-Decrease (td)	T-Increase (ti)	Test duration
IEC 50HZ VOLTAGE VARIATION	70%	0°	10 s	1 cycle	abrupt	25 cycle	3 pulses
IEC 60HZ VOLTAGE VARIATION	70%	0°	10 s	1 cycle	abrupt	30 cycle	3 pulses

ANSI C.62.45_ 2002, Combination w ave							
File name implemented	Voltage	Polarity	Impedance	Phase	Coupling	Rep. time	Test duration
ANSI 1-PH BASIC 1 CAT. A1	2000V	±	2	0°- 270°/90°	L, N -> PE	10 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A2	4000 V	±	2	0°- 270°/90°	L, N -> PE	20 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A3	6000 V	±	2	0°- 270°/90°	L, N -> PE	20 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A1	2000V	±	2	0°- 270°/90°	L -> N	10 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A2	4000 V	±	2	0°- 270°/90°	L -> N	20 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A3	6000 V	±	2	0°- 270°/90°	L -> N	20 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1	2000V	±	2	0°- 270°/90°	L1, L2, L3, N -> PE	10 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A2	4000 V	±	2	0°- 270°/90°	L1, L2, L3, N -> PE	20 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A3	6000 V	±	2	0°- 270°/90°	L1, L2, L3, N -> PE	20 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1	2000V	±	2	0°- 270°/90°	L2 -> L1	10 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A2	4000 V	±	2	0°- 270°/90°	L2 -> L1	20 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A3	6000 V	±	2	0°- 270°/90°	L2 -> L1	20 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1	2000V	±	2	0°- 270°/90°	L3 -> L2	10 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A2	4000 V	±	2	0°- 270°/90°	L3 -> L2	20 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A3	6000 V	±	2	0°- 270°/90°	L3 -> L2	20 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1	2000V	±	2	0°- 270°/90°	L1 -> L3	10 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A2	4000 V	±	2	0°- 270°/90°	L1 -> L3	20 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A3	6000 V	±	2	0°- 270°/90°	L1 -> L3	20 s	10 pulse

ANSI C.62.45_ 2002, Ring wave							
File name implemented	Voltage	Polarity	Impedance	Phase	Coupling	Rep. time	Test duration
ANSI 1-PH BASIC 1 CAT. A1 12R LN-PE	2000V	±	12	0°- 270°/90°	L, N -> PE	10 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A2 12R LN-PE	4000 V	±	12	0°- 270°/90°	L, N -> PE	20 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A3 12R LN-PE	6000 V	±	12	0°- 270°/90°	L, N -> PE	20 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A1 30R LN-PE	2000V	±	30	0°- 270°/90°	L, N -> PE	10 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A2 30R LN-PE	4000 V	±	30	0°- 270°/90°	L, N -> PE	20 s	10 pulse
ANSI 1-PH BASIC 1 CAT. A3 30R LN-PE	6000 V	±	30	0°- 270°/90°	L, N -> PE	20 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A1 12R LN-PE	2000V	±	12	0°- 270°/90°	L -> N	10 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A2 12R LN-PE	4000 V	±	12	0°- 270°/90°	L -> N	20 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A3 12R LN-PE	6000 V	±	12	0°- 270°/90°	L -> N	20 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A1 30R LN-PE	2000V	±	30	0°- 270°/90°	L -> N	10 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A2 30R LN-PE	4000 V	±	30	0°- 270°/90°	L -> N	20 s	10 pulse
ANSI 1-PH BASIC 2 CAT. A3 30R LN-PE	6000 V	±	30	0°- 270°/90°	L -> N	20 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1 12R L1L2L3N-PE	2000V	±	12	0°- 270°/90°	L1, L2, L3, N -> PE	10 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1 12R L1L2L3N-PE	4000 V	±	12	0°- 270°/90°	L1, L2, L3, N -> PE	20 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1 12R L1L2L3N-PE	6000 V	±	12	0°- 270°/90°	L1, L2, L3, N -> PE	20 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1 30R L1L2L3N-PE	2000V	±	30	0°- 270°/90°	L1, L2, L3, N -> PE	10 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1 30R L1L2L3N-PE	4000 V	±	30	0°- 270°/90°	L1, L2, L3, N -> PE	20 s	10 pulse
ANSI 3-PH BASIC 1 CAT. A1 30R L1L2L3N-PE	6000 V	±	30	0°- 270°/90°	L1, L2, L3, N -> PE	20 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1 12R L2-L1	2000V	±	12	0°- 270°/90°	L2 -> L1	10 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1 12R L2-L1	4000 V	±	12	0°- 270°/90°	L2 -> L1	20 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1 12R L2-L1	6000 V	±	12	0°- 270°/90°	L2 -> L1	20 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1 30R L2-L1	2000V	±	30	0°- 270°/90°	L2 -> L1	10 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1 30R L2-L1	4000 V	±	30	0°- 270°/90°	L2 -> L1	20 s	10 pulse
ANSI 3-PH BASIC 2 CAT. A1 30R L2-L1	6000 V	±	30	0°- 270°/90°	L2 -> L1	20 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1 12R L3-L2	2000V	±	12	0°- 270°/90°	L3 -> L2	10 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1 12R L3-L2	4000 V	±	12	0°- 270°/90°	L3 -> L2	20 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1 12R L3-L2	6000 V	±	12	0°- 270°/90°	L3 -> L2	20 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1 30R L3-L2	2000V	±	30	0°- 270°/90°	L3 -> L2	10 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1 30R L3-L2	4000 V	±	30	0°- 270°/90°	L3 -> L2	20 s	10 pulse
ANSI 3-PH BASIC 3 CAT. A1 30R L3-L2	6000 V	±	30	0°- 270°/90°	L3 -> L2	20 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1 12R L1-L3	2000V	±	12	0°- 270°/90°	L1 -> L3	10 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1 12R L1-L3	4000 V	±	12	0°- 270°/90°	L1 -> L3	20 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1 12R L1-L3	6000 V	±	12	0°- 270°/90°	L1 -> L3	20 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1 30R L1-L3	2000V	±	30	0°- 270°/90°	L1 -> L3	10 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1 30R L1-L3	4000 V	±	30	0°- 270°/90°	L1 -> L3	20 s	10 pulse
ANSI 3-PH BASIC 4 CAT. A1 30R L1-L3	6000 V	±	30	0°- 270°/90°	L1 -> L3	20 s	10 pulse

9 DESCRIPTION OF THE 25 PIN D-SUB SIGNALS

9.1 Interlock

Between Pin 5 (hi) and Pin 2, 8, 15, 20 (low).

This connection is an integral part of the interlock safety circuit. If a number of units are incorporated in a system, then these connections can be "daisy-chained" together to form a single safety circuit. If no external interlock circuit is required then the shorting connection must be made by using the terminator connector supplied. Otherwise pulse generation in the system will be inhibited.

A built in circuit breaker enables the EUT power supply also to be switched off, while the interlock function only blocks the generation of pulses or any other ongoing test resp.

The interlock is a safety function to ensures the following:

- The interlock forms a bus to which all instruments in a system are connected.
- The interlock feature can be connected to external safety devices (door contacts, test enclosure hoods, etc.).
- If any part of the interlock circuit is interrupted, all the generator modules are inhibited from producing or switching high voltages. Additionally the power supply to the EUT can be switched off too.
- Activation of this safety feature is reported to the master controller.
- The master controller is also notified when the interlock facility is reset.
- Once the interruption is over and the re-instatement of the interlock has been acknowledged, then power to the EUT is restored.

Activation of the interlock function is achieved without the help of microprocessors and software. This ensures that the safety feature is not affected or hindered in the event of a program crash.

9.2 Trigger to scope output signal

Between Pin 18 (hi) and Pin 2, 8, 15, 20 (low)
Inactive state: at 24 V, in the active state: < 2.4 V

Note: The trigger signal has generally a duration of approx. 50 µs e.g. for surge testing. In case of bursts its width shall change according to the length of the event. During PQT testing (supply voltage variations) the width of the trigger signal shall change according to the duration of the voltage dip or interrupts.

9.3 Synchronization (Sync) signal: Output signal

Between pin 7 (hi) and pin 2, 8, 15, 20 (low)
Inactive state: at 24 V; in the active state: < 2.4 V

The sync signal consists of a level that goes low for each cycle of the mains frequency. The reference is the signal at the power supply input ("EUT supply IN"). The position (timewise) of the sync signal corresponds to the specified phase angle (converted into time, irrespective of the supply frequency).

The sync signal is only active while an AC test is in progress and Fsync is set to sync.

9.4 Pulse enable / next step input

Between pin 17 (hi) and pin 2, 8, 15, 20 (low)
Input open = inactive; input shorted = active

If this input is activated during a test run the test is halted (exactly the same as the pause function in the control software). The test will continue to run as soon as the input is made inactive again.

If the input is already active before a test is implemented then the test cannot start.

9.5 EUT fail input

Between pin 6 (hi) and pin 2, 8, 15, 20 (low)
Input open = inactive; input shorted = active

This connection serves as a control input that can be activated externally.

The EUT can activate this input if it is capable of reporting a disturbance effect caused during an EMC test. Such events are time/date stamped by the system and are stored together with the current test parameters for subsequent use in a test report if required.

10 COUPLING NETWORK CDN 3061

Parameter	Value
Instrument supply:	85...265 VAC
Decoupling attenuation:	Remanent pulse 15% max. Mains side crosstalk 15% max.
Standard-conform pulse:	1.2/50 µs up to 6.6 kV 8/20 µs up to 3.3 kA
Mains decoupling:	1.5 mH
Connections:	Pulse input(s) from generator Cable connector for EUT supply input and output Power inlet for CDN
EUT supply:	1-phase (P / N / PE)
EUT VAC:	50 to 270 V rms, 50/60 Hz (Phase - Neutral), 400 Hz max.
EUT VDC:	0 to 270 VDC
EUT current:	1 x 16 A rms continuous over heat protected 1 x 25 A rms for 30 min
EFT (burst):	Standard coupling all lines to HF reference ground GND IEC/EN 61000-4-4 and ANSI (IEEE) C62.41 L, N, PE → GND Any lines and combination to ref GND: L → GND N → GND PE → GND L,N → GND L, PE → GND N,PE → GND

Combination wave pulse:	Line to line (2 Ω) L → N / L → PE / N → PE IEC/EN 61000-4-5 Lines to ground (12 Ω) L → PE / N → PE / L, N → PE
Combination wave & ring wave:	ANSI (IEEE) C62.41 Basic 1 & 2 L, N → PE & L → N Supplemetal 1 & 2 N → PE & L → PE Diagnostic 1 & 2 N, PE → L & L, PE → N
Ring wave:	IEC/EN 61000-4-12 12 / 30 Ω L → N / L → PE / N → PE L → PE / N → PE / L, N → PE
PQT:	IEC/EN 61000-4-11/-4-29 Dips & interrupts to phase L

11 MAINTENANCE AND FUNCTION CHECK

11.1 General

Inside the test system there are no adjustable elements accessible to the user neither for calibration nor for maintenance purpose.

The housing of the test system must not be opened (exceptional for SW update via SD-card). Should any maintenance or adjustment become necessary, the whole test system, together with an order or fault report, should be sent in to a Teseq service center.

Maintenance by the user is restricted to cleaning the outer housing, performing a function check and verification of the pulse parameters.

The only exception concerns the exchange of modules or the upgrading of the system with new modules. In such cases the instructions accompanying the modules are to be strictly observed.

11.2 Cleaning

In general a moist cloth is sufficient for cleaning the outer housing, including the touch panel. If necessary add a small amount of a mild, non-foaming household cleanser.

No chemicals (acid, etc) should be used for cleaning purposes.

Before beginning to clean the test system ensure that it is switched off and the mains power cable is unplugged from the supply.

11.3 Function check

The safety measures described previously must be strictly observed while carrying out a function check.

As soon as the test system is switched on the Power-LED should light up. If this is not the case then please check the mains power connection to the test system as well as the fuses, voltage selector and any other cabling.

The instrument automatically carries out a diagnostic routine once it has been successfully switched on.

The generator cannot perform any test while the interlock circuit is open.

Pulse generation can be observed at the output connectors by means of an oscilloscope. This is a practical way to check that the system is functioning correctly but should never be used for reference or calibration purposes.

Do not connect the oscilloscope directly in order not to exceed its max. input voltage.
Teseq recommends the use of a HV differential probe type MD 200 or MD 200A along with the INA 6560 safety banana adapter as well as CAS 3025 and MD 300. (See paragraph: Options).

11.4 Calibration

The combination of high voltages and high frequencies in a single pulse makes the calibration of EMC pulse generators particularly demanding and difficult. Teseq has one of the few accredited test laboratories in Europe that is in the position to undertake calibrations in this specialized field.

11.5 Warranty

Teseq grants a warranty of 2 years on this test system, effective from the date of purchase.

During this period, any defective components part will be repaired or replaced free of charge or, if necessary, the test system will be replaced by another of equivalent value. The decision regarding the method of reinstating the functional capability is at the sole discression of Teseq.

Excluded from the warranty is damage or consequential damage caused through negligent operation or use as well as the replacement of parts subject to degradation.

The warranty is rendered invalid by any intervention on the part of the customer or a third party.

The faulty items have to be returned in their original packaging.

Teseq accept no responsibility for damage in transit.

12 DECLARATION OF CONFORMITY (CE)

The equipment is CE-certificated. The following standards apply:

Type of standard	Standard number	Remark
Product family standard	EN 61010	Safety requirements for electrical equipment for use in measurement, control, regulation and laboratory applications
Generic standard	EN 61000-6-3	Electromagnetic compatibility (EMC); generic standard for interference radiation; Part 6.3 for residential, business and trade applications as well as small businesses
Generic standard	EN 61000-6-4	Electromagnetic compatibility (EMC); generic standard for interference radiation; Part 6.4 industrial applications
Generic standard	EN 61000-6-1	Electromagnetic compatibility (EMC); generic standard for interference immunity; Part 6.1 for residential, business and trade applications as well as small businesses
Generic standard	EN 61000-6-2	Electromagnetic compatibility (EMC); generic stadard for interference immunity; Part 6.2 for industrial applications
Product family standard	EN 60326-1	Electrical equipment for measurements, control and laboratory use

The requirements cannot be fulfilled in some cases. (The true purpose of an interference generator is to produce interference signals. Emission limitations can therefore only be complied with if the equipment is operated inside a Faraday cage).

Deviations from the requirements are stated and explained in the appendix to the conformity declaration.

The interference immunity has been tested successfully as per EN 61326-1.

13 TECHNICAL DATA

13.1 Dimensions/weight

Parameter	Value
Dimensions NSG 3060:	W: 449 mm (17.7″) H: 310 mm (12.9″; 7 HU) D: 565 mm (22.2″)
Weight NSG 3060:	22 kg (48.5 lb) approx.
Dimensions CDN 3061-C16:	W: 449 mm (17.7″) H: 221.5 mm (8.7″; 5 HU) D: 565 mm (22.2″)
Weight CDN 3061-C16:	20 kg (44 lb) approx.

13.2 Options

Parameter	Value
CAS 3025:	Burst/EFT verification set
MD 200A:	High voltage differential probe
MD 300:	Current probe
INA 166:	Rack mounting 5 HU
INA 167:	Rack mounting 7 HU

13.3 Accessories for IEC/EN 61000-4-11

Parameter	Value
INA 6501:	Manual step transformer, 16 Arms, 0/40/70/80%
INA 6502:	Automatic step transformer, 16 Arms, 0/40/70/80%
VAR 3005-S16:	Automatic single variable transformer, 16 Arms
VAR 3005-D16:	Automatic double variable transformer, 16 Arms

13.4 Accessories for IEC/EN 61000-4-8/-4-9

Parameter	Value
MFO 6501:	Magnetic field option, manual for -4-8
MFO 6502:	Magnetic field option, automatic for -4-8
INA 701:	Magnetic field loop 1 x 1 m – for AC with MFO max. 4 A/m (-4-8) – for surge* max. 1200 A/m (-4-9)
INA 702:	Magnetic field loop 1 x 1 m – for AC with MFO max. 40 A/m (-4-8) – for surge* max. 1200 A/m (-4-9)
INA 703:	Magnetic field coil 1 x 1 m; max. 330 A/m -4-8
INA 3251:	Cable to interconnect INA 703 with MFO 6501 OR 6502
INA 752:	Pulse shape adapter for -4-9 *) INA 752 needed to surge generator

13.5 Accessories for IEC/EN 61000-4-4/-4-5

Parameter	Value
CDN 3061-C16-PQM	Automated 1-phase coupler for EFT/Burst (4.8 kV), Surge (6.6 kV) and Dips, Interrupts and Variations with EUT supply up to 270 V / 16 A
CDN 3061-C16	Automated 1-phase coupler for EFT/Burst (4.8 kV) & Surge (6.6 kV) with EUT supply up to 270 V / 16 A
CDN 3063-S16	Automated 1-phase coupler for Surge (6.6 kV) with EUT supply up to 270 V/ 16 A
CDN 3063-B32	Automated 3-phase coupler for EFT/Burst (4.8 kV) only with EUT supply up to 480 V / 32 A
CDN 3063-C32	Automated 3-phase coupler for EFT/Burst (4.8 kV) and Surge (6.6 kV) with EUT supply up to 480 V / 32 A
CDN 3063-S32	Automated 3-phase coupler for Surge (6.6 kV) only (combination and ring wave) with EUT supply up to 480 V / 32 A
CDN 3063-S63	Automated 3-phase coupler for Surge (6.6 kV) only (combination and ring wave) with EUT supply up to 480 V / 63 A
CDN 3063-S100	Automated 3-phase coupler for Surge (6.6 kV) only (combination and ring wave) with EUT supply up to 480 V / 100 A
CDN 3083-B100	Manual 3-phase coupler for EFT/Burst (8 kV) only with EUT supply up to 690 VAC (1000 VDC) / 100 A
CDN 3083-B200	Manual 3-phase coupler for EFT/Burst (8 kV) only with EUT supply up to 690 VAC (1000 VDC) / 200 A
CDN 3083-S100	Manual 3-phase coupler for Surge (8 kV) only (combination and ring wave) with EUT current up to 100 A
CDN 3083-S200M	Manual 3-phase coupler for Surge (8 kV) only (combination and ring wave) with EUT current up to 200 A

CDN 117/118:	Coupling networks for signal / data lines (surge)
CDN HSS-2	Coupling network for 2 kV surge pulse 1.2 / 50 µs IEC/EN 61000-4-5 on unshielded symmetrical high speed telecom lines (Ethernet)
CDN 3425	Burst EFT capacitive coupling clamp for data line coupling per IEC 61000-4

14 SYSTEM DESCRIPTION

Description:	Test system for EMC tests with mains-borne interference in accordance with the EN 61000-6-1 and 2 standards for burst, surge and mains quality tests. Operation via touch-screen or software-wise via a PC link Ethernet TCP/IP interface. Pulse output to external coupling networks. Housing for bench-top or rack use.
Housing:	Bench-top housing made of metal with moulded plastic front panel. Supplementary rack-mounting kit.
Mains on/off:	On/off switch on rear panel of the instrument
Indicator LED's on front panel:	Power on: LED, yellow Pulse: LED, green High voltage active: LED, red EUT Power on: LED, green Error: LED, red
Safety functions:	Main fuses, interlock, EUT fail input
Ambient conditions:	+5° to 40°C, 20 to 80% relative humidity (non-condensing), 68–106 kPa atmospheric pressure
Self-test:	Routines for functional self-test
Relevant safety standards:	IEC 61010-1 safety requirements for electrical equipment used for measurement and control purposes as well as laboratory use
Relevant EMC standards:	IEC/EN 61000-6-1 and 2; generic standards for electromagnetic interference immunity

Headquarters
Teseq AG
4542 Luterbach, Switzerland
T +41 32 681 40 40
F +41 32 681 40 48
sales@teseq.com
www.teseq.com

China
Teseq Company Limited
T +86 10 8460 8080
F +86 10 8460 8078
chinasales@teseq.com

Germany
Teseq GmbH
T +49 30 5659 8835
F +49 30 5659 8834
desales@teseq.com

Singapore
Teseq Pte Ltd.
T +65 6846 2488
F +65 6841 4282
singaporesales@teseq.com

Taiwan
Teseq Ltd.
T +886 2 2917 8080
F +886 2 2917 2626
taiwansales@teseq.com

USA
Teseq Inc.
T +1 732 417 0501
F +1 732 417 0511
Toll free +1 888 417 0501
usasales@teseq.com

To find your local partner within Teseq®'s global network, please go to **www.teseq.com**

Manufacturer
Teseq AG
4542 Luterbach, Switzerland
T +41 32 681 40 40
F +41 32 681 40 48
sales@teseq.com

France
Teseq Sarl
T +33 1 39 47 42 21
F +33 1 39 47 40 92
francesales@teseq.com

Japan
Teseq K.K.
T +81 3 5725 9460
F +81 3 5725 9461
japansales@teseq.com

Switzerland
Teseq AG
T +41 32 681 40 50
F +41 32 681 40 48
sales@teseq.com

UK
Teseq Ltd.
T +44 845 074 0660
F +44 845 074 0656
uksales@teseq.com

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